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"Theoretical Background and Empirical Supply Estimates of the U.S. Livestock Sector"

by

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ABSTRACT

This report documents the theoretical background and the statistical structure of the U.S. livestock supply component that will become part of the U.S. country model in the IIASA (International Institute for Applied Systems An linkage system)* The methodological framework of the estimated statistical models is presented in Section I, ~~In this section~~ where the literature on the capital asset approach to livestock modeling is reviewed and its implications explored. Section II deals with the empirical estimates of the following components of livestock supply: beef (including veal) and dairy, pork, lamb and sheep (including wool production), and poultry (including eggs and turkey). ~~This section~~ It also ~~deals with~~ discusses the empirical estimates of feed demand of corn, barley, sorghum, oats, wheat, roughage and hay, soybean meal and all other oilseed meals. Finally, in Section III, the dynamic properties of livestock supply are described and their implications explored.

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* This paper was produced for limited distribution to *
* the research community outside the U.S. Department *
* of Agriculture. *
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Forward

This report documents the modeling activities related to the U.S. livestock disaggregated supply model as part of the comprehensive U.S. model which will be used in conjunction with other country models in the IIASA linkage structure.

In Section I, a critical review of existing economic models in the livestock sector is presented. This section was prepared with the collaboration of Donald W. Regier. Here, the structure, limitations and possible improvements of existing theoretical models are analyzed. With this theoretical background in mind, the statistical estimates of the U.S. livestock supply model are presented and discussed in Section II.

The U.S. livestock model deals explicitly with the following supply components: beef (including veal) and dairy, pork, sheep and lamb, poultry (including turkey) and eggs. Excluding the sheep and lamb component, the structure of the other components is similar to different versions of the USDA's cross-commodity model; the specification of some of the equations was changed, new equations were added and all equations were constrained to satisfy the homogeneity of degree zero condition in prices. Section II also includes the historical validation of the supply components and the statistical estimates of the input derived demand functions for the feed grains, hay, soybean meal and other high protein meals.

Section III deals with the dynamic characteristics of the livestock supply model. Since the IIASA model is expected to be used for policy simulations and analysis of a 15 year horizon, it is important to evaluate the long run (steady state) characteristics of the model.

Because of the mathematical complexities in dealing with non linear non homogeneous systems of difference equations, only an empirical verification of the dynamic characteristics of the model will be presented at this stage.

On this occasion, I wish to express my gratitude and appreciation to Sue Tuan for her invaluable assistance in the computational aspects of this report and to Rose Mayhew for her typing and retyping of the manuscript.

Finally, but not less important, I would like to thank Vernon Roningen Branch Chief of Trade Policy in IED, for his efforts to make my stay in Washington as productive as possible.

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Section I

"A Critical Review of Existing Economic Models in the Livestock Sector"

Modeling the livestock economy and obtaining reliable econometric estimates of the underlying structure of livestock production and supply has been a long time effort in the field of agricultural economics.

A characteristic feature of the state of the art in livestock modeling and supply estimation is the great variability of sign and magnitude in the price elasticities that have been estimated for the U.S. supply of slaughtered beef. Among annual models, positive own price elasticities of supply have in the short-run been estimated for fed feed by Langemeir and Thompson (1967), Freebairn and Rausser (1975), Folwell and Shapouri (1977) and Shuib and Menkhaus (1977). But while Freebairn and Rausser estimated positive own price short run supply elasticities for non feed beef, Langemeir and Thompson and Shuib and Menkhaus estimated negative values for these same elasticities. Using a different classification, Reutlinger (1966) and Ospina and Shumway (1979) found negative own price supply elasticities for cows in the short-run, but different signs and magnitudes of price elasticities for steers and heifers. These results are summarized in Table 1.

Differing levels of time and product aggregation and grading, estimation techniques, the difficulty of separating the short-run and long-run effects of a change in current beef prices and the analytical conceptualization of the formation of expectations are among the reasons given for such divergent results.

Table 1:--Summary of Short-Run Price Elasticities of Beef Supply: U.S.*

	Elasticity with respect to the price of				
Beef Category	Choice Beef	Good Beef	Utility Beef	Corn	All Beef
Ospine and Shumway:					
Steers, choice	2.63	-2.50		-.65	
Steers, good	.00	.12		.31	
Heifers, choice	3.16	-2.68		-1.03	
Heifers, good	-.85	1.34		.02	
Cows			-.18		
All Beef				-.25	.14
Reutlinger:	Fed Beef	Non fed Beef			
Steers					.16 to .18
Heifers					-.69 to .63
Cows					-1.23 to -.92
All Beef					-.17 to -.03
Langemeir and Thompson:					
Fed Beef	.23				
Non fed Beef		-.55			
All Beef					.16
Freebairn and Rausser:					
Fed Beef	0				
Non fed Beef		.61			
All Beef					.14
Folwell and Shapouri:					
Steer-Heifer	.06				
Other Beef		0			
All Beef					.04
Shuib and Mankhaus:					
Fed Beef	.14				
Non fed Beef		-.97			

* Source: Ospina and Shumway.

It is the purpose of these review to survey the existing theoretical models in livestock in order to explore their theoretical and empirical aspects and to illuminate the specific attributes that are important in livestock modeling and estimation.

Unlike other sectors of the agricultural economy such as grains and vegetables, livestock supply is subject to relatively long production lags and while it is influenced by its demographic composition which is dynamically related through time, it is also affected by the economic alternatives existing at each age cohort.

The fact that each age cohort is recursively dependent on younger age cohorts and the fact that each age cohort has current available marketing alternatives, have long been recognized (but not always explicitly) as a crucial component of livestock modeling. This recognition has naturally led to considering a head of livestock as a multipurpose consumable capital asset.

The alternative uses of a male calf are:

1) An immediate consumer good -- veal,
2) A growth asset -- to become a steer,
3) As a steer, to be consumed as non fed beef,
4) As a steer, to be put on feed on further growth -- and eventual slaughter as fed beef, and
5) To be raised as a bull.

Similarly the principal alternative uses of a heifer calf are:

1) A consumer good -- veal
2) An investment good -- to become a heifer,
3) As a heifer, to be consumed as non fed beef,

4) As a heifer, to be put on feed as a further investment good for further growth -- and eventual slaughter as fed beef,

5) An investment good -- to become a beef cow and breed calves,

6) An investment good -- to become a milk cow, produce milk and breed calves, and

7) Eventually as a cull cow -- to be consumed as non fed beef.

Considering the current and future disposition of livestock and assuming that livestock producers wish to maximize their expected stream of profits over time implies that livestock will not be disposed for slaughter and consumption while its expected value in the future, namely as a capital asset, exceeds its current market value for slaughter. Accordingly, cattlemen manage the sizes and composition of their herds to complement each other and to accommodate to the other assets of the enterprise, in terms of land, buildings, feed supplies, transportation and handling facilities. They do this with respect to expected growth performance of the different age cohorts in the herd and present and expected prices.

Hildreth and Jarret (1955) were the first ones to formalize in a mathematical framework the intertemporal allocation of resources and production in the livestock sector. They consider the decisions and plans of the livestock producer during the t th time period. The producers production function is

$$(1)\ n_t = \rho(x_t, K_t, N_t)$$

where n_t represents the output produced during the t th period, x_t stands for the vector of current inputs and K_t represents durable capital equipment at the beginning of time t. They also assume that

the firm's own output is required in the production process N_t. This stock of output on hand reflects the capital asset component of livestock production.

The amount of output sold during the period is denoted by s_t and is related to the output on hand at the beginning and end of the period by the accounting relation

$$(2)\ N_{t+1} = N_t + n_t - s_t$$

The profits obtained during the t th period is given by

$$(3)\ w_t = p_t s_t - q_t x_t - r_t(K_{t+1} - \beta K_t)$$

where p_t, q_t, r_t stand for the current prices of s_t, x_t and K_t, respectively, β represents the proportion of the fixed captial at the beginning of the period that is still available for use of the end of the period. During period t the producer decides x_t, n_t, s_t, N_{t+1}, K_{t+1} and w_t subject to restriction given by (1), (2), and (3). These decisions are made according to the following preference function

$$(4)\ P_t = \delta(w_t, \tilde{w}_{t+1}, \tilde{N}_{t+2}, \tilde{K}_{t+2})$$

where $\tilde{w}_{t+1}$, $\tilde{N}_{t+2}$ and $\tilde{K}_{t+2}$ are the planned values of the respective variables at the end of period t+1. The specification of P_t is a reflection of the fact that plans for future periods are relevant for current decisions because it is always possible to increase current profits at the cost of depleting the resources (N,K) available for future production. Hildreth and Jarret assume that plans are made one period ahead and are based on anticipated prices for period t+1. These anticipated prices are denoted as $\tilde{p}_{t+1}$, $\tilde{q}_{t+1}$, $\tilde{r}_{t+1}$. For plans to be consistent, the technical and accounting restrictions that will hold in period t+1 must be taken into account. They are

$$(5) \quad n_{t+1} = \tilde{\rho}(\tilde{x}_{t+1}, K_{t+1}, N_{t+1})$$

$$(6) \quad \tilde{N}_{t+2} = N_{t+1} + \tilde{n}_{t+1} - \tilde{s}_{t+1}$$

$$(7) \quad \tilde{w}_{t+1} = \tilde{p}_{t+1} \tilde{s}_{t+1} - \tilde{q}_{t+1} \tilde{x}_{t+1} - \tilde{r}_{t+1}(\tilde{K}_{t+2} - \beta K_{t+1})$$

Therefore, at time t, as the producer observes p_t, q_t, r_t and knows K_t and N_t, he forms anticipation of p_{t+1}, q_{t+1}, and r_{t+1}. He then decides x_t, n_t, s_t, K_{t+1}, N_{t+1}, w_t and forms plans $\tilde{x}_{t+1}$, $\tilde{n}_{t+1}$, $\tilde{s}_{t+1}$, $\tilde{K}_{t+2}$, $\tilde{N}_{t+2}$, $\tilde{w}_{t+1}$, so as to maximize his preference function (4). In other words the producer maximizes function (4) subject to the constraints specified by functions (1), (2), (3), (5), (6) and (7).

If there exists a unique and internal solution, Hildreth and Jarret show that the following conditions of allocating inputs and production will hold:

$$(8) \quad \frac{\partial \rho}{\partial w_t} p_t = q_t$$

$$(9) \quad \frac{\partial \delta}{\partial \tilde{w}_{t+1}} \left(\frac{\partial \tilde{\rho}}{\partial K_{t+1}} \tilde{p}_{t+1} + \beta \tilde{r}_{t+1}\right) = \frac{\partial \delta}{\partial w_t} r_t$$

$$(10) \quad \frac{\partial \delta}{\partial \tilde{w}_{t+1}} \left(\frac{\partial \tilde{\rho}}{\partial N_{t+1}} \tilde{p}_{t+1} + \tilde{p}_{t+1}\right) = \frac{\partial \delta}{\partial w_t} p_t$$

$$(11) \quad \frac{\partial \tilde{\rho}}{\partial \tilde{x}_{t+1}} \tilde{p}_{t+1} = \tilde{q}_{t+1}$$

$$(12) \quad \frac{\partial \tilde{w}_{t+1}}{\partial \tilde{K}_{t+2}} = \tilde{r}_{t+1}$$

$$(13) \quad \frac{\partial \tilde{w}_{t+1}}{\partial \tilde{N}_{t+2}} = \tilde{p}_{t+1}$$

These six conditions together with the six constraints specified above establish uniquely the 12 decisions and planned variables which the producer chooses at time t.

The condition in (8) represents the well known result from static theory that the current marginal value product equals the current

price of the input. Conditions (9) and (10) are typical conditions obtained from dynamic analysis.

The left hand side bracketed term in (9) shows the planned (or expected) marginal profits when the durable capital equipment is currently increased, namely $\frac{\partial \tilde{W}_{t+1}}{\partial K_{t+1}}$.

When multipled by the marginal effect of an increase in expected profits on the preference function - $\frac{\partial \delta}{\partial \tilde{W}_{t+1}}$, we obtain the subjective valuation of an increase in durable capital for future production. On the other hand, a current increase in durable capital for future production affects current profits negatively by the amount of r_t which in turn affects the subjective preference function by $\frac{\partial \delta}{\partial w_t}$. In equilibrium, the subjective valuation of the increased expected profits is equal to the subjective valuation of the current increased costs.

The same results hold with respect to an increase in the stock of livestock on hand. The bracketed left hand term in (10) shows the marginal increase in expected profits that results from an increase in current inventories of livestock, namely $\frac{\partial \tilde{W}_{t+1}}{\partial I_{t+1}}$. This is evaluated in terms of the preference function when multiplied by $\frac{\partial \delta}{\partial \tilde{W}_{t+1}}$. On the other hand, increasing current inventories imply, cetris paribus, a reduction in current sales and therefore a current marginal loss of p_t. When evaluated in terms of the preference function, equilibrium conditions require that the marginal benefits are equal to the marginal penalties when current livestock inventories are increased. This last condition affecting the intertemporal allocation of livestock inventories is a crucial aspect of estimating supply functions for livestock and has become the core of the theory presented by Jarvis (1969, 1974), exploring the implications of considering cattle as capital assets. We shall deal with the subject later on.

Condition (11) states that the expected marginal value product of the input equals its expected price and conditions (12) and (13) state that the expected marginal profits from increasing $\tilde{K}$ and $\tilde{N}$ is equal to their expected respective prices.

An interesting consequence of this theory as presented by Hildreth and Jarret is that current production n_t and current input demand x_t are independent of anticipation or expectations. Equations (1) and (8) can be simultaneously solved for n_t and x_t and the solutions involve only exogenous and predetermined variables. This is important when econometric estimation is considered. In general all other unknowns (decisions and plans) depend on both the predetermined variables and on anticipation or expectations.

While the Hildreth and Jarret analysis is important in specifying the predetermined and exogenous variables which affect the decision and planned variables, it does not indicate the likely effects of changes in the predetermined and exogenous variables on the decision and planned variables. Clearly, it is not an easy task to conduct meaningful comparative static analysis in a system as complex as the one they considered. Moreover, as will be later shown, it is not clear that unambigous results can be obtained from such an analysis. In their empirical model which deals with livestock in the aggregate, they specify the quantity of livestock and livestock products sold as dependent, among other variables, on the prices of feed grains and farm labor and on the price of livestock and livestock products. For the lack of a better alternative, they assumed that anticipated prices are functions of current prices. Their estimates show that input price increases lead to an increase in current supply

and that product price increase leads to a decline in current supply. Justifying these results, they claim that as a price of an input rises and if anticipated prices are an increasing function of current prices, it will lead to a decrease in inventory held for future production and hence, to an increase in current supply. Similarly, with respect to product prices, they claim that "...in the absence of offsetting factors, an increase in price (particularly of cattle) leads to favorable anticipations, to an attempt to build up inventories and lower current sales, and to a strengthening of the tendency for current prices to rise" (op. cit. page 106). This is cited as a destablizing tendency in livestock production. Therefore, it is the investment demand for inventory, in their opinion, that is the main force in explaining current supply of livestock and livestock products.

Later modeling and econometric analysis of beef supply have heavily relied on conventional investment demand theory as an important factor affecting current beef supply. According to Grilliches (1963) investment demand theory implies that the higher the expected price of the output relative to expected input price, the more will be invested. Following this approach, Reutlinger (1966) stipulated the following model

$$(14)\quad S_t = A_t - D_t$$

$$(15)\quad D_t = I_{t+1} - I_t = b(I^*_{t+1} - I_t)$$

$$(16)\quad I^*_{t+1} = \alpha_1 + \alpha_1\, P^*$$

where: S = slaughter,
A = available supply,
D = investment demand,
I^* = desired inventory, and
P^* = expected real price of beef.

Assuming that the available supplies of cows are proportional to the actual inventories of cows, namely $A^c_t = cI_t$ we obtain actual beef supply as

where the β's are known functions of the parameters of the model. In (17) the slaughter of cows is negatively related to the expected price of beef. Furthermore, Reutlinger assumes that the available supplies of heifers will increase with the expected prices since more calves will be kept and less will be slaughtered. This is an important consideration since it reflects the fact that economic factors may affect the demographic compostion of the herd. Therefore, for heifers the function of A is modified to become

$$(18) \quad A_t^H = c_0 + c_1 P^* + c_2 I_t$$

Solving for the amount of beef resulting from the slaughter of heifers we obtain

$$(19) \quad S_t^H = \gamma_0 - \gamma_1 P^* + \gamma_2 I_t$$

$$\text{and} \quad \gamma_1 = \delta_1 - c_1$$

where δ_1 stands for the effect of expected price P^* on the demand of heifers as stock (as is affected by transferring heifers to the breeding herd). According to Reuthinger, the sign of γ_1 is ambiguous and it depends on $\delta_1 \gtrless c_1$. Therefore as the expected price of beef increases, the supply of beef from slaughtered heifers will depend on whether investments in the breeding herd will be larger or smaller than the investments that take form in postponing the slaughter of calves.

Irrespective of the problem of how price expectations are generated, there are a few theoretical difficulties with the Reutlinger model. First, relation (18) contradicts an important corellary of the Hildreth and Jarret model. This corellary stems from relations (1) and (8) which imply that the availability supply of livestock on hand does not depend on expected prices. Second, and more important, since investment in livestock inventory is a continuous process because there exist an immediate alternative of disinvestment (slaughter) at

market price, conventional investment demand theory is not a satisfactory framework for analyzing livestock supply. Therefore, Reutlinger's assumption that an increase in the expected price of beef increases the demand for livestock stocks is not fully justified by conventional economic theory.

Since the investment and disinvestment decisions related to the inventory of livestock on hand is affected by either postponing or moving ahead the slaughter of animals, the timing of these decisions should be an important variable to be dealt with. Taking such an approach, Jarvis (1969, 1974) was the first one to explicitly deal with the implications of livestock inventory as a capital asset. In this approach, the single animal is the focal point of analysis. In the Jarvis model it is the cumulative value of all products to be derived from the individual animal which constitutes the animal's expected income stream. Maximizing the stream of future profits discounted to the present is the objective of the cattleman. Expected discounted revenue is netted against the expected discounted costs anticipated over the remaining life of the animal to determine the discounted net profit of holding the animal as compared with selling it. An optimal decision implies that the appropriate moment of sale is the point in time (or alternatively, the age of the animal) beyond which the increase in costs exceeds the gain in income stream value, all discounted to the present.

Because of the theoretical and empirical importance of the Jarvis model, we shall take a rather detailed look at its implications.

The net discounted value at birth for both male and female animals is given by the following expressions:

$$(20) \quad \text{Male} \quad VM_0(A,I) = PW\, e^{-rA} - cI \int_0^A e^{-rt}\, dt$$

$$(21) \quad \text{Female} \quad VF_0(A,I) = PW\, e^{-rA} - cI \int_0^A e^{-rt}\, dt + \sum_{t=1}^{A} \frac{C(I,t)}{(1+r)^t} + m \int_0^A M(I,t)\, e^{-rt}\, dt$$

where: $VM(0)$ = net discounted value at birth of a male animal,
$VF(0)$ = net discounted value at birth of a female animal,
$P = P(I,A)$ = market price of a unit of weight of an animal aged (A) and fed input ration (I),
$W = W(I,A)$ = weight at sale of an animal aged (A) and fed input ration (I) 1/,
I = ration of feed or other inputs,
A = age of animal at slaughter,
r = interest rate,
c = cost per unit of the input,
$C = C(I,t)$ = expected value of a calf born in period (t) assuming mother cow has been fed input ration (I) throughout its life,
m = market price of milk, and
$M = M(I,t)$ = expected quantity of milk to be produced by a cow aged (t) and feed input ration (I).

The value of the male animal contains two terms: (1) the selling price of the animal by weight for meat, and (2) the cost of the feed and other inputs during the animal's life. In addition to these terms, the value of the female animal contains: (3) the expected cumulative value of the calves ever to be born to this female, and her descendents and (4) the cumulative value of the milk to be produced. It should be noted that the value of calves to be born contains allowance for the value of future generations of calves to be born to resulting heifers, and their milk.

If the functions (20) and (21) have a maximum and are continuously twice differentiable functions of A and I, the unique optimal values of the decision variables may be obtained by the usual method of calculus.

Since the alternative uses of a male animal (steer) are more restricted than those of a female (cow), it is easier to analyze the theoretical implications of (20) and those of (21).

For a steer the optimal slaughter age at any feeding rate will be obtained at the point in time where the increase in revenue will be equal

to the increased cost (inclusive of capital cost) due to keeping the steer a bit longer on the farm.

Let

$$(22)\quad K(A,I) = VM_0(A,I)\, e^{rA} + \frac{cI}{r}\,(e^{rA} - 1)$$

stand for the total cost of a steer slaughtered at time A and fed a given ration I. The first term in (22) stands for capital cost and the second for feeding cost. But from (20) it follows that in equilibrium

$$(23)\quad K(A,I) = PW$$

and these two functions are tangent to each other. This solution is shown in Figure 1.

For a male animal the optimal slaughter age implies that the rate of return from weight gain equals the rate of interest plus the ratio of feed cost to the animal's market value. At a lower age, the value of the animal's increased weight exceeds the additional costs of interest and feed. At a higher age, the gain in market value of the animal falls short of the rise in cost of feed and foregone interest. At the optimal slaughter age, the present discounted profit of the animal is at a maximum, and this is the present capital value of the animal to the cattle firm. Capital value at the time of marketing exceeds market value at all ages except the optimal slaughter age, and transactions involving younger animals are negotiated at the capital value. This is shown in Figure 2.

A rise in the expected price of beef raises the value of a calf under all of the alternative uses and asset forms enumerated above for both male and female calves. It is possible, then, that as the animal becomes more valuable than before it will no longer be eligible, under the priorities of management, for sale in the market for slaughter. This possibility is strongly stressed by Jarvis (1974) as being the likely

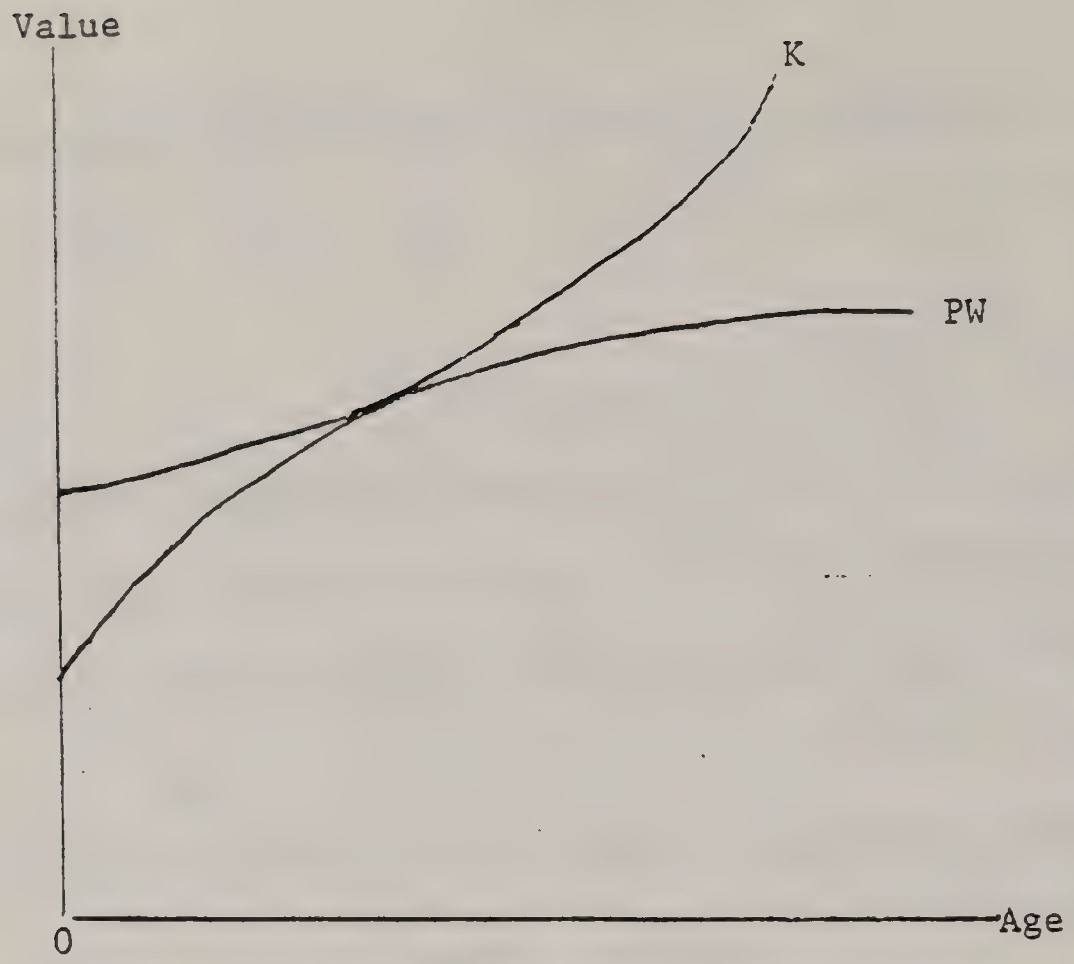

Fig. 1: Optimal Slaughter Age of a Steer.
[Source: Jarvis 1969 and Iver 1971]

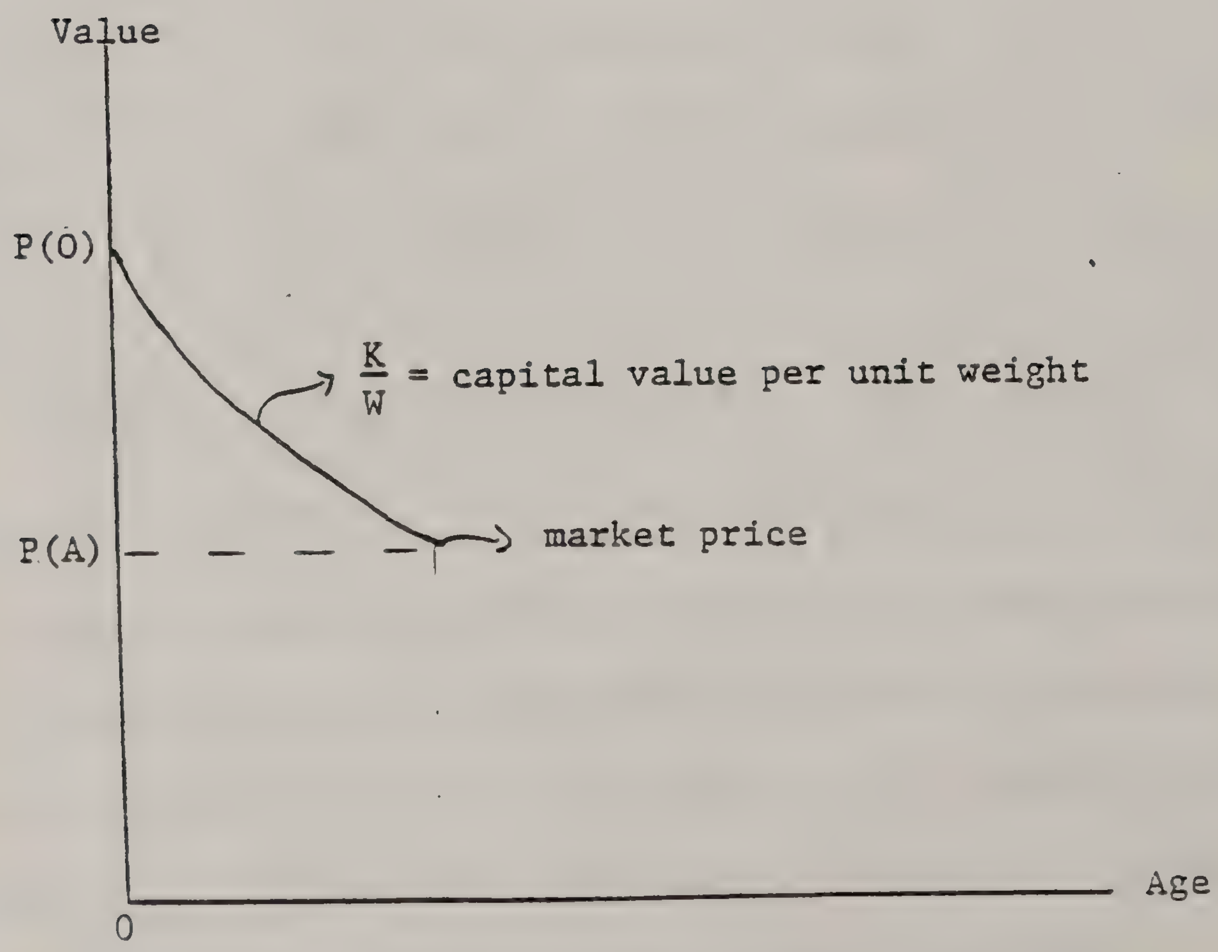

Fig. 2: Capital and Market Price of a Steer.
[Source: Iver 1971]

result of models (20) and (21). However, it can easily be shown (see Appendix to section I) that in general the above conclusion is not warranted since as the price of beef increases, the capital cost will increase too; as the capital cost increases it is not certain that postponing slaughter is the optimal reaction of management to an increase in the price of beef (see Appendix to section I).

The inclusion of capital cost as a component of total cost implies that the rate of substitution between any variable input such as feed and the timing of slaughter also depends on the price of beef and on the price of the feed ration. From (20) and assuming that the price of beef does not depend on its quality, we obtain that the slope of the iso-cost function:

$$(24) \quad \frac{dI}{dA}\Big|_{\bar{W}} = \frac{W_A}{W_I} = -\left(\frac{cI+rP\bar{W}}{e^{rA}-1}\right)\frac{r}{c}$$

where $W_A = \frac{\partial W}{\partial A}$, $W_I = \frac{\partial W}{\partial I}$ and $\bar{W}$ stands for a given animal weight.

Assuming that W is strictly quasiconcave in A and I, the least cost combination of A and I to produce $\bar{W}$ given r, c and P is illustrated by point R in Figure 3.

Notice that the isocost function is convex towards the origin. If the price of beef increases the least cost combination to produce $\bar{W}$ will move from R to T, since at any point (A,I) the slope of the isocost function increases in absolute value. This implies that as the price of beef increases more will be fed and the animal will be slaughtered at an earlier age if production is to be kept at $\bar{W}$. This is the substitution effect of a change in the price of beef and shown in Figure 3 as a move from A_0 to A_1. If as a result of an increase in the price of beef, production increases to $\bar{W}'$, a new solution may be obtained at Z. Such an equilibrium implies that as price and production increase animals will be slaughtered at an earlier age than in R;

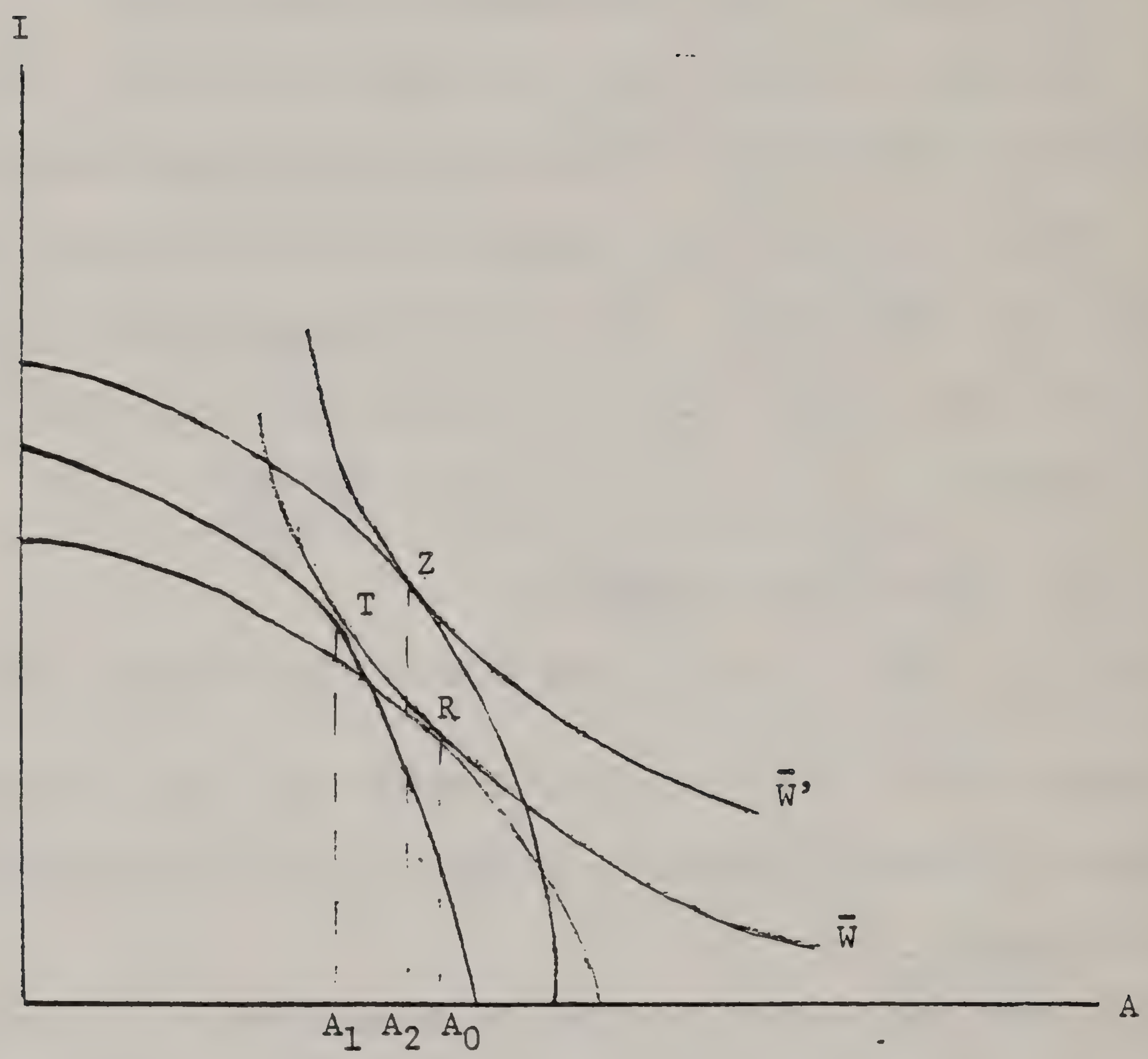

Fig. 3: Graphical Analysis of the Effects of a Change in P.

compare A_2 to A_0. But depending on the shapes of the isoquants and isocost functions, Z may occur at a point where the optimal timing of slaughter is larger than A_0.

It is therefore possible to summarize the effects of an increase in the price of beef on the timing of slaughter as being dependent on a negative substitution effect and on a positive or negative expansionary effect. The total effect will depend on the relative strength of substitution and expansion.

When the substitution effect is stronger in absolute value than the expansionary effect, the short-run supply of beef will increase as price increases; it follows that long-run supply will decline. On the other hand, when the expansionary effect is dominant, an increase in the price of beef will result in an increased supply of beef in the long-run and a decreased supply in the short-run.

In a similar fashion we may trace the effects of an increase in the price of feed -c on the derived demand for feed. It should be noticed that in this model the demand for feed is represented by AI namely, by the product of the daily ration I times the age at which the animal will be slaughtered. As c increase the slope of the isocost function declines in absolute value at any point (I,A) resulting in a decrease in I and in an increase in A at the initial equilibrium level of $\bar{W}$. This is illustrated in Figure 4 as a move from N to M.

As feed becomes more expensive relative to the capital cost involved in postponing slaughter, the daily ration will decrease and the animal will be kept longer on the farm if the production level of $\bar{W}$ is not changed. But if the optimal production level declines to $\bar{\bar{W}}$ the daily ration will decline further and reach a new equilibrium at point L.

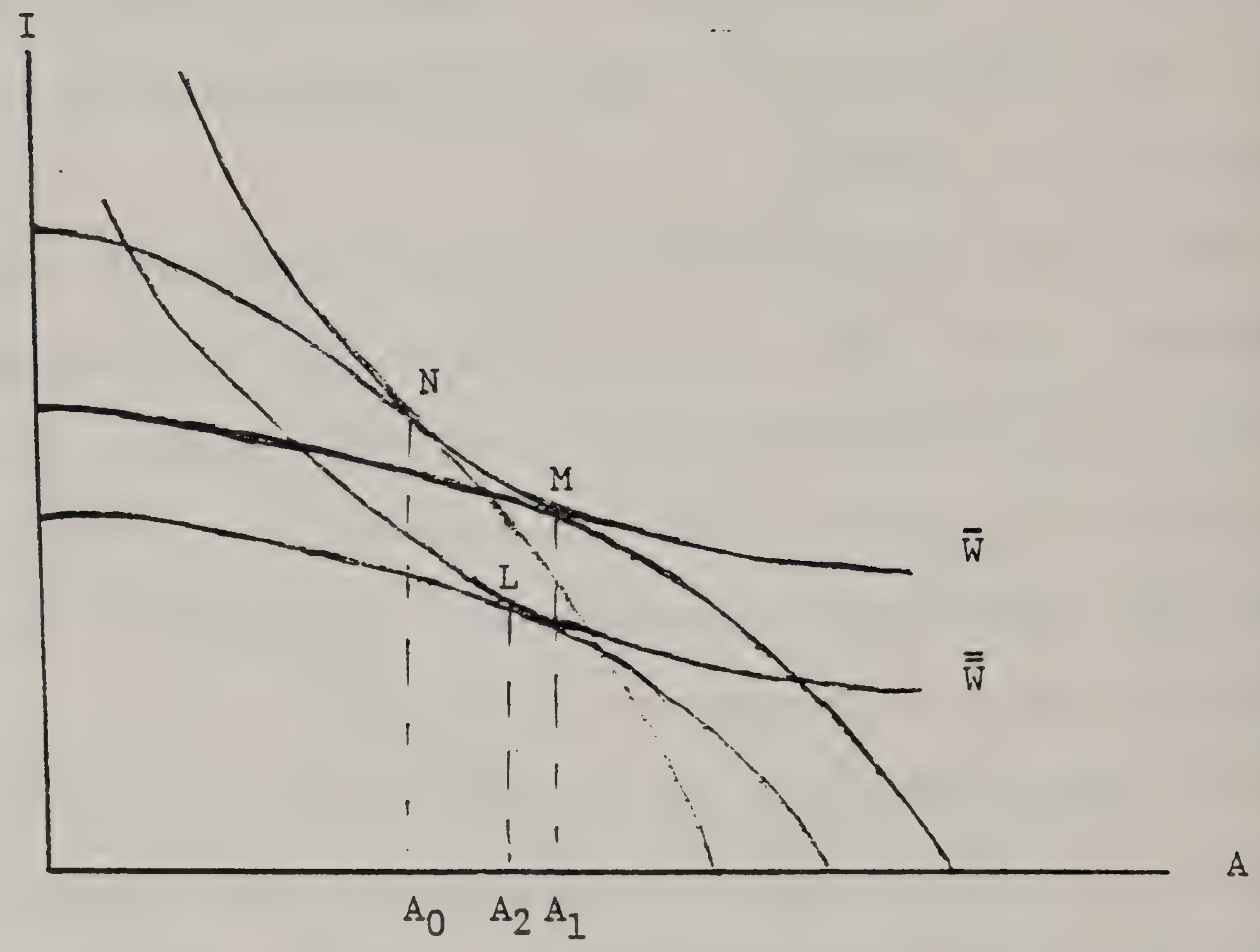

Fig. 4: Graphical Analysis of the Effects of a Change in c.

It is quite possible that at the new equilibrium the steer will be kept longer than at the initial equilibrium N (See Appendix to section I) thereby increasing supplies in the long-run. As for the amount of feed demanded at L, the daily ration will decrease but the steer will be fed longer then at the initial equilibrium N. Therefore, if production declines as a result of an increase in the price of feed, the feeding ration will decline too but the timing of slaughter may either be advanced or postponed. If it is advanced, the short-run supply of beef will increase and if it is postponed, the long-run supply of beef will increase.

The model as presented in (20) and (21) may be expanded to include additional available inputs such as labor, different kinds of feed (concentrate, silage), etc. The addition of these variable inputs does not affect the implications of the model as they were analyzed above. As far as the input mix necessary to produce any desired level of beef at minimum cost is concerned, the usual conditions hold, namely:

$$(25) \quad \frac{dj}{di}\Big|_{\bar{W},\bar{A}} = \frac{W_i}{W_j} = \frac{c}{k}$$

where W_j stands for the marginal product of input j and k its price. It should be noticed that the above conditions hold only if the price of beef does not depend on its quality. Otherwise, the isocost functions will become non-linear. From conditions (24) and (25) together with the production function we may obtain the derived input demand functions. [2/] These functions will be homogenous of degree zero with respect to all input prices and output price.

Despite the theoretical ambiguities already mentioned there are several conclusions that may be drawn from models (20) and (21):

The slaughter age is greater for females than for males.

The value at birth is greater for females than for males.

The optimal slaughter age for males occurs while the animal is still gaining weight (provided price is not affected by quality).

The optimal slaughter age for females may occur after the animal has ceased to gain weight, because of the value of the expected calf and milk output.

The response of capital values at birth to an increase in the beef price is positive. Moreover, the response is greater for females than males.

The response of capital values at birth to an increase in feed prices is negative for both male and female animals. Moreover, the response is greater in absolute value for females than males.

Change of equal proportion in both beef and feed prices does not change the optimal slaughter age of eigher male or female animals.

The response of capital values at any age to a change in the beef price is positive and larger for female than male animals. The beef price elasticities are unity at the optimal slaughter ages; at lesser ages the elasticities are greater than unity and declining with age.

The response of capital values at any age to a change in feed prices is negative and larger in absolute value for female than male animals. The feed price elasticities are zero at the optimal slaughter ages; are negative at lesser ages; and decline in absolute value with age.

The elasticity of change in capital values (at any age) to changes in prices of beef or feed is larger (in absolute value) for female than male animals.

Change of equal proportion in both beef and feed prices induces change in the same proportion in the capital values of both male and female animals.

Change of unequal proportions in beef and feed prices induces change in the structure of capital values in the herd by age and sex.

Establishment of a new steady state equilibrium, following a disruption of beef and feed market prices, implies a change in the structure of capital values for the herd by age and sex.

The theoretical analysis presented above dealt with long-run supply and derived demand response to external shocks with respect to a single animal, be it a steer, a heifer or a cow. The same theoretical ambiguities of

their response to external shocks will exist for all of them. These ambiguities are compounded when we deal with the herd instead of a single animal since the cattle-herd is a capital complex composed of animals of different ages and sex. This is a major difficulty with the Jarvis model since it deals with decisions concerning a single animal or a given sex and age cohort whereas in reality decisions are taken concerning the whole herd, specifically in the short-run. While in the long-run there are no effective restrictions on the farmer and optimal decisions concerning each age and sex cohort may be obtained independently, in the short-run it is not possible to abstract from the herd as a crucial component of the intertemporal aspect of livestock production. This is due to the fact that the elements of the livestock herds advance through time as a system of causal chains and the current available economic alternatives of each sex and age cohort is not independent of the state of preceeding and following age cohorts. Identities link stocks and flows as well as connect the inventories of successive periods. The breeding herd is the critical element in the system:

Breeding herd beginning inventory (time t + 1)	= Breeding herd beginning inventory (time t)
	+ Additions to the herd (during time t)
	- Eliminations from the herd (during time t)

The young animals born to the breeding herd become the initial elements in herd categories identified by sex and age. Animals for slaughter are taken from appropriate herd categories according to criteria of age, preparation, function, price. Investment takes the form of

the other hand Nerlove, Grether and Carvalho (1979) have suggested a contrasting approach by considering the herd as the focal point of interest and not explicitly dealing with the different kinds of animals comprising the herd. In their model, animals are differentiated only by age. They assume that the cattleman maximizes profits for the whole period that he will stay in business - say m periods and then retire. In each period he must take decisions based on actual facts and on facts that he does not yet know for the future periods. Let the periods, calendar years, be numbered in ascending order backwards from his retirement in year m. According to age, three kinds of animals are recognized in this model: I_{oj}, animals born in period j which cannot be sold in this period; I_{ij}, animals less than one year of age at the beginning of period j which can be sold for slaughter at their market price c_j; and animals over one year of age in period j.

The objective is to maximize

$$\begin{aligned}(26)\quad & V(S_n, \delta_n, V_n, C_n | K_n, F_n, I_{1n}, n) \\ & = q_n V_n + p_n S_n + c_n C_n - \tfrac{1}{2} a(K_n - \delta_n - V_n)^2 \\ & - \tfrac{1}{2} b(K_n - V_n)^2 - \tfrac{1}{2} d(I_{on})^2 - \tfrac{1}{2} f(F_n + I_{1n} - \delta_n - C_n - S_n)^2 \\ & - \tfrac{1}{2} g(F_n - S_n)^2 \\ & + \alpha E_n[V(S_{n-1}, \delta_{n-1}, V_{n-1}, C_{n-1} | K_{n-1}, F_{n-1}, I_{1n-1}, n-1)]\end{aligned}$$

subject to the restrictions

$$F_n = F_{n+1} + I_{1n+1} - \delta_{n+1} - C_{n+1} - S_{n+1}$$

$$K_n = K_{n+1} + \delta_{n+1} - V_{n+1}$$

$$I_{on} = \lambda K_n, \ I_{1n} = I_{on+1} = \lambda K_{n+1}$$

where: $V(S_n, \delta_n, V_n, C_n | K_n, F_n, I_{1n}, n)$ = expected present value of profits when there are n periods to retirement,
S_n = actual sales at time n of fed animals at price p_n,
δ_n = new animals added to the herd at time n,
V_n = culling at time n at price q_n,
C_n = number of calves sold for slaughter at time n at price c_n,
K_n = capital stock at time n, consists of all animals kept for reproductive purposes,

change by a greater absolute number than the male sales. Under (3) a tendency may be expected for an increase in average carcass weights within a given herd category (but not across the entire herd) to accompany a rise in capital values as the market price increase.

Disruption of equilibrium through changes in market prices alters both the level of capital values and relative capital values of animals of different sex and age. A new equilibrium implies a new set of capital values. 3/

But there are additional factors which affect short-run behavior. One of the conclusions stated above concerning the herd in the long-run is to the effect that a rise in the beef price or a drop in the feed price may raise the optimal slaughter age of ever animal, making it worthwhile to raise them all to an older age. Yver (1971) has pointed out that at the industry level there are likely to be short-run constraints making it difficult or impossible to fatten them all. The constraints tend to take the form of limitations on grazing land and feed supplies. Under the pressures of herd building, capital values of land tend to rise, as well -- or not to fall. The shadow price of land can be expected to rise in the short-run until land can be shifted from crops to grazing, as is observed to occur in Argentina. The land price effect is a reinforcement of the impetus to invest in (i.e., to withhold) the animals with the longer discounting horizons. This again favors retaining young females and constitutes a further reason for selling steers or older males.

As we already mentioned, one limitation of the Jarvis model is that it deals with the single animal without considering the constraints imposed by the herd dynamics in maximizing income for the planning horizon. On

values of the uncertain variables in place of their actual values as if they were certain. Therefore, in the recursive maximization procedures just described, the problem is solved as if the cattleman knows with certainty the values of the future prices and then introduces the expectation operator where suitable.

As Nerlove, Grethur and Carvalho show the general analytical solution when there are n periods left is:

$$(27)\quad S_n = \beta_{11}p_n - \beta_{12}c_n - \beta_{13}E_n(p_{n-2}) + F_n$$

$$(28)\quad \delta_n = -\beta_{22}c_n + \beta_{23}E_n(p_{n-2}) + \beta_{24}q_n + \beta_{25}E_n(q_{n-1}) + \beta_{26}E_n(c_{n-2})$$

$$(29)\quad V_n = -\beta_{32}c_n + \beta_{34}\, q_n + K_n$$

$$(30)\quad C_n = -\beta_{41}p_n + \beta_{42}c_n - \beta_{43}E_n(p_{n-2}) - \beta_{44}q_n - \beta_{45}E_n(q_{n-1}) -\beta_{46}E_n(c_{n-2}) - \beta_{47}E(p_{n-1}) + I_{1n}$$

The linear coefficients β_{ij} are functions of the parameters of the model and are independent of the variables of the model. These supply functions may be estimated using econometric models. Notice that these supply functions depend only on current prices, on expected prices and on current animal stocks. Input prices do not affect these functions since the pertinent cost functions are assumed to be quadratic which implies constant per unit costs. In our view, the constant per unit cost is an invalid assumption on theoretical grounds; we shall return to this point later on.

According to equation (27), higher current prices of fed beef imply an increase in the supply of feeder cattle and a decrease in the number of calves sold for slaughter (30); but as the expected price of fed beef increases, the current supply feeder cattle will diminish. Also, as the expected price of fed beef increases, the addition of new animals to the herd will increase (28) and fewer calves will be sold for slaughter (30).

F_n = stock of animals on feed at time n,
$\frac{1}{2}a(K_n+\delta_n+V_n)^2$= maintenance cost of animals in stock,
$\frac{1}{2}b(K_n-V_n)^2$ = aging cost of animals kept in stock,
$\frac{1}{2}d(I_{on})^2$ = cost of producing calves,
$\frac{1}{2}f(F_n+I_{1n}-\delta_n-C_n-S_n)^2$ = feeding cost for animals on feed,
$\frac{1}{2}g(F_n-S_n)^2$ = aging cost of animals on feed,
α = one period discount factor,
$E_n[V(S_{n-1},\delta_{n-1},V_{n-1},C_{n-1}|K_{n-1},F_{n-1},I_{1n-1},n-1)]$ = expected value of next period profits, and
E_n = expectation operator at period n.

This model is conceptually similar to the model by Hildreth and Jarret that was discussed earlier. It differs in its explicit objective function and in its emphasis on cost functions instead of production functions. This emphasis on cost functions imply some contradictions to the Jarvis model, as it will be shown later.

The model as presented in equation (26) implies selecting in every period the optimal values of the variables represented by S_n,δ_n,V_n,C_n. The optimal values of these decision variables depend on current revenue and cost and on the expected profits from the next to the current period up to the retirement of the cattleman. Since the objective function is assumed to be quadratic, the solutions have the following properties: (a) they exist and are unique, (b) they may be explicitly obtained by the dynamic programming method, and (c) they satisfy the conditions for first period certainty equivalence. The dynamic programming method is a recursive maximization procedure starting from the period just before the cattleman retires. Having obtained the solution for this period, the problem is to solve for the next to the last period and so on, for as many periods as necessary for determination of the same solution when there are n periods left, for any n.

It has been shown that the maximization problem, as presented in equation (26), satisfies all the conditions for one period certainty equivalence; i.e. the first period action that maximizes V is equivalent to the action that disregards uncertainty and maximizes V with the expected

One explicit result is that the expected beef price (whether of fed beef, of calves or of utility meat) positively affects the investment decision of adding animals to the herd. On the other hand, these expected prices affect negatively the disinvestment decisions of selling animals for slaughter. This result is not surprising since the assumption of fixed marginal costs does not allow capital costs changes due to product price changes.

A second explicit result is that current prices of the different outputs in the model affect the supply of the various kinds of slaughtered animals differently. It is therefore not difficult to visualize situations in which, according to the level of aggregation, current prices may have either positive or negative effects on slaughtered beef. This possibility is well highlighted in Table 1.

Finally, the difficulty of conceptualizing the generation of price expectations should be mentioned. This difficulty is well illustrated by the discussion between Elam (1975) and Tryfos (1975). In most of the empirical research on this subject it is assumed either that current prices reflect expected prices, or that expected prices are generated by a distributed lag formulation of past prices. In contrast, Nerlove et. al. have been relatively successful in formulating a single-time-series procedure for expectation formation models generated by a quasi-rational approach.

Summarizing this section it can be said that the capital approach to livestock modeling implies an interplay of expected and current prices at each age cohort. Expected prices affect supply through an substitution effect and through an expansionary effect. Conventional theory of the firm suggest that this two effects have the same signs while the capital approach suggest that this effects may have opposite effects. Taking an approach such as in consumer demand theory, the substitution

Similarly as the current price of calves increases, current slaughter of calves will also increase (30) but as a result fewer feeder cattle will be supplied (27) and the new additions to the herd (28) and culling (29) will diminish. On the other hand, an increase in the expected price of calves will have the opposite effects.

All these results seem a priori plausible but they are based, among other things, on the assumption of fixed per unit costs. While possible, from a technical point of view, this assumption implies a contradiction of the notion that cattle are capital goods. As was previously shown, treating cattle as capital goods implies a capital cost that has to be considered when optimal decision rules are derived. Since the cost of capital depends among other things, on product prices (price of calves, price of fed beef, etc.), per unit cost cannot be independent of product prices as implied by the results in equations (27) through (30). In other words on a theoretical basis the β_{ij} coefficients cannot be considered as fixed.

Irrespective of its theoretical deficiencies, the Nerlove et. al. model includes the main ingredients of a realistic model of livestock: it is dynamic in nature since it considers the demographic constraints inherent in livestock production; decisions are based on current and expected market prices of the different kinds of output and it accounts, at each point of time, for the economic alternatives of each age cohort. Moreover, it deals with all these components in an explicit fashion allowing the analytical derivation of quantitative hypothesis regarding the effects of the different current and expected prices on the investment and dis-investment activities related to maintaining the desired herd size.

Footnotes to Section I

1/ Production function specification and estimation in livestock has received considerable attention in the literature. For a concise summary and bibliography on the subject the reader may turn to Dillon (1977). Still it may be worth mentioning that recent developments in the theoretical analysis of the production function in beef have led Wilson (1976) to conclude that cattle feeding is constrained by appetite limitations to the rising average physical production portion of the production function (stage I of production). In this case the objective function should be changed to a cost function, and optimal behavior to cost minimization.

2/ The literature dealing with the derived input demand functions in livestock production is quite extensive. A good review on this subject is presented by Womack (1976).

3/ Equilibrium conditions will be affected by two balance identities for any given year:

$$H = H_{-1} + B_{-1} - S_{-1} - D_{-1}$$

$$H = H^* + C + X$$

where H is the beginning inventory and H* is the desired herd size. B, S, and D stand for births, slaughter, and deaths. C and X represent domestic consumption and exports. Stationary equilibrium implies that the opening inventory is the previous year's desired herd size. The

$$H = H^* = H_{-1}$$

and

$$C + X = B - S - D$$

which is to say, the excess of births over slaughter and deaths equals the number of animals in demand for local consumption and export without reducing the size of the herd.

may be separated from the expansionary effect and tested by appropriate econometric techniques. In the interplay of expected and current prices the latter is a reflection of the alternative cost facing the cattleman but as expected prices become functions of current prices, in practice it may be difficult to disentangle the substitution effect from the expansionary effects. A theoretical framework to accomplish this has not yet been proposed.

Section II

Statistical Estimates and Historical Validation of the U.S. Livestock Supply Model

The theoretical approach underlying the livestock supply model is discussed in the previous section. In general, livestock may be looked upon as consumable capital assets. This implies that current and future production in the livestock sector are to be considered in the context of investments and disinvestments which are determined by the relationship of their value as a capital asset as compared to their current market value. Investment takes the form of retention from slaughter and breeding. Disinvestments appear as slaughter of animals. Therefore, the intertemporal aspects of livestock production and the herd dynamics are closely related. Underlying these relationships are the available production technologies, the existing and expected market conditions and government policies.

Our previous analysis implies that any empirical analysis of the livestock sector which deals with the dynamic aspects of investments, disinvestments and production has to depend on the state variables of the system which may be looked upon as constraints and on the expected values of input and product prices. The state variables are the initial stocks of animals in the different herd categories.

Since there are additional constraints that are not explicitly dealt with in this analysis such as buildings, equipment, machinery, etc., the decision variables in the model may not react instantly to a given change in the state variables or in the expected prices. To account for any delayed reaction in the decision variables due to the existence of the above mentioned constraints, a one year lagged decision variable was at times added to the specifications of the model.

4/ It is only for the sake of mathematical convenience that the analysis is done in terms of the calf's value at birth. We could just as well began the analysis at anytime $A < \hat{A}$ without affecting the qualitative aspects of the results.

5/ The indeterminacy of the effects of changes in c, r, and S on $\hat{A}, \hat{I}$ is not related to the fact that the expected price of meat depends on its quality. This can be easily shown when all the partial derivatives of P are dropped. In this case the sufficient conditions for obtaining the "intuitive" signs of the partial derivatives of $\hat{A}$ and $\hat{I}$ with respect to c, r, and P are:

$$\frac{W_A}{W} \frac{W_{AI}}{W_I} < r \text{ and } W_{AI} < \frac{c}{P}$$

II.1 The U.S. Beef and Dairy Supply Submodel

In this submodel, animals are classified as belonging to the breeding herd and those that do not belong to the breeding herd. The breeding herd is composed of two categories: the beef breeding herd and the dairy breeding herd. The underlying relation governing the relationship of stocks and flows for each of the breeding herds is:

$$ST_t = ST_{t-1} - SL_{t-1} + AD_{t-1}$$

where:

ST_t = beginning stock of breeding herd,
SL_{t-1} = slaughter of breeding herd animals during the previous period,
AD_{t-1} = additions to breeding herd during the previous period.

Calves, steers and non-bred heifers are not part of the above balancing relations but are accounted for by the following underlying relation:

$$HS_t = HS_{t-1} + HB_{t-1} - HS_{t-1} - HD_{t-1} - HH_{t-1}$$

where:

HS_t = beginning stock of calves, steers and heifers,
HB_t = number of calves born during period t,
HS_t = number of calves, steers and heifers slaughtered in period t,
HD_t = number of calves, steers and heifers that died in period t,
HH_t = number of male calves and heifers that were transferred to the breeding herds in period t.

The specifications dealing with the additions and subtractions from the dairy and the beef herds are very similar in nature. They all depend on the beginning stocks of the pertinent herd and on some lagged function of the product to input price ratios. Different lagged structures were considered and estimated, but only the best specifications are presented.

Similarly, the number of fed and non-fed steers and heifers slaughtered and the number of calves slaughtered was assumed to depend on the beginning stocks of calves, steers and heifers and on the relative output to input prices.

As far as expected prices are concerned, they were formulated as functions of current and lagged prices.

In this section four submodels of the U.S. supply model are presented: beef (including veal) and dairy, pork, poultry (including turkey) and lamb and sheep (including wool production). In this section we also deal with the input demand functions for the feed grains (corn, sorghum, barley, oats and wheat, separately), hay, soybean meal and other high protein meals. Each of these submodels and the input demand functions will be presented separately with a short description of their main characteristics, results and historical validation. All the equations were estimated by the least squares method.

In the Appendix to this section, the data and statistical properties of the estimated equations are presented.

the effects of beef prices on the capital value of cattle because the alternative costs of fed beef production are much higher than the alternative costs of non-fed beef production. Also, because of these same reasons, one should expect a negative effect of a relative beef price increase on the number of calves slaughtered.

A yield equation of milk was estimated introducing a variable intended to capture the effects of technological change - the percentage of cows supervised by the Dairy Improvement Association. This equation also depends on the price of milk relative to the price of corn and to the average number of dairy cows in the herd. Total milk production is then obtained from multiplying the yield per cow by the estimated average number of dairy cows on hand. But this approach may be subject to the compounded errors from the yield equation and from the dairy-cows-inventory equation. An alternative approach is to estimate directly a milk production function. Since milk production has no feedback to the rest of the model, the simultaneous solutions of the other endogenous variables are not affected by the specification of the milk production function. The two alternative specifications of milk production are presented.

The relation between products and herds in the beef and dairy model are presented in the following flow chart diagram.

Next, the equations of the model are presented and are followed by the historical simultaneous validation of the model. The underlying data and the statistical properties of the estimated equations are presented in the Appendix to this section.

Empirically, the statistical estimates of some of these equations seem to improve as a one year lagged dependent variable is added to the list of independent variables. Presumably this is a reflection of an adjustment mechanism related to some constraints which are not explicitly dealt with in this model.

The production equations explain the amounts produced of fed beef, of non-fed beef and of veal. Each of these equations depend on the pertinent number of sluaghtered animals and on the corresponding ratios of product and input prices. For given numbers of slaughtered animals, the estimated coefficients of the price ratios measure their effects on the average weight per animal slaughtered.

The statistical estimates of the equations related to the additions and substraction from the dairy and the beef herds are highly consistent between themselves. So, as the relative price of milk increases, more heifers are added to the dairy herd and less cows from the dairy herd are slaughtered. As far as the beef herd is concerned, a higher current relative price of meat will reduce the number of beef cows slaughtered requiring less additions to the herds in the short-run to substitute for the slaughtered beef cows in the herd. But as the increase in the relative price of beef is sustained for longer periods of time, not only less beef cows will be slaughtered but more heifers will be added to the beef herd.

For cattle not belonging to the breeding herds as steers and heifers, the beef price effects on slaughter and production are different depending on whether these animals are fattened or not. If they are fattened, a higher current relative price of beef will increase slaughter and production while if they are not fattened, a higher current relative price of beef will reduce the number of animals slaughtered and the amount of non-fed meat produced. This is consistent with the implications of

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MODEL: BEEFDAIY

SYMBOL DECLARATIONS

ENDOGENOUS:
   BEEAP     = BEEF, TOTAL PRODUCTION, US, MIL LBS, dress weight
   BEEAPFD   = TOTAL FED BEEF, MIL LBS, dress weight
   BEEAPNF   = TOTAL PROD NON-FED BEEF, MIL LBS, dress weight
   BEEHT     = BEEF, ENDING STOCKS, US, MIL LBS, dress weight
   CALKS     = CALVES, SLAUGHTER, TOTAL, US, MIL HEAD
   CALSC     = CALVES, NUMBER BORN, US, MIL HEAD
   CATKSNF   = CATTLE, NON-FED, SLAUGHTER, US, MIL HEAD
   COWKSMC   = COWS, DAIRY, SLAUGHTER, US, MIL HEAD
   COWKSNF   = COWS, BEEF NON-FED, SLAUGHTER, US, MIL HEAD
   COWSEMC   = COWS, DAIRY, ADDITIONS TO HERD, US, MIL HEAD
   COWSNBE   = COWS, BEEF, NUMBER ON FARMS, JAN1, US, MIL HEAD
   COWSNMC   = COWS, DAIRY, NUMBER ON FARMS, JAN1, US, MIL HEAD
   COWYILD   = MILK PRODUCTION PER COW, 1000 LBS PER HEAD
   HAFCAV    = CALVES, HEIFERS AND STEERS, NUMBER ON FARMS JAN 1, MIL HEAD
   HEISBBE   = HEIFERS, BEEF, NUMBER FOR BREEDING, US, MIL HEAD
   MILAP     = MILK, TOTAL PRODUCTION, US, BIL LBS
   MILAP2    = SAME AS MILAP
   SAHKS     = STEER AND HEIFER SLAUGHTER, US, MIL HEAD
   SAHKSFD   = STEER AND HEIFER FED SLAUGHTER AND FARM SLAUGHTER, MIL HEAD
   VEAAT     = VEAL, PRODUCTION, COMMERCIAL, CARCASS WEIGHT, US, MIL LBS

DEFINITION:
   CVI       = COST INDEX IN BEEF PRODUCTION
   FCCFC     = FEED PRICE INDEX

EXOGENOUS:
   BAHPF     = BARLEY, AVERAGE PRICE RECEIVED BY FARMERS, US, $/BU
   CALDD     = CALVES, DEATH LOSS, US, MIL HEAD
   CALPF     = CALVES, VEAL, AVERAGE PRICE RECEIVED BY FARMERS, US, $/CWT, live weight
   CATPFFD   = CATTLE, PRICE, SLAUGHTER STEERS, OMAHA, ALL WTS AND GR, $/CWT, live weight
   CATPFFE   = CHOICE FEEDER CATTLE, KAN. CITY, ALL WTS AND GRADES, $/CWT, live weight
   CATPFNF   = CATTLE, UTILITY COW PRICE, OMAHA, $/CWT, live weight
   CORPF     = CORN, AVERAGE PRICE RECEIVED BY FARMERS, OCT-SEP, US, $/BU
   DUM73     = DUMMY VARIABLE, 1973=1, OTHERS=0
   DUM74     = DUMMY VARIABLE, 1974=1, OTHERS=0
   MILPF     = MILK, ALL WHOLESALE, AVE PRICE RECEIVED BY FARMERS, US, $/CWT
   OATPF     = OATS, AVERAGE PRICE RECEIVED BY FARMERS, JUL-JE, US, $/BU
   PCOWIMP   = PERCENTAGE COWS SUPERVISED BY DAIRY HERD IMPROVEMENT ASSOC,
               PERCENTAGE
   PIDUM590  = DUMMY VARIABLE TO SPLICE DATA
   PTFHMCP4  = INTEREST RATE, PRIME COMMERCIAL PAPER, 4-6 MO., PERCENT
   PTPCSUT   = TRANSPORTATION, CONSUMER PRICE INDEX, (1967=1.0)
   PTPWOSI   = FUEL AND UTILITIES, CONSUMER PRICE INDEX, (1967=1.0)
   PTWHHMP   = WAGE RATE IN MEAT PACKING INDUSTRY, $/HR
   SOMPF     = SOYBEAN MEAL PRICE, US(C.Y.), CENTS/LB
   SORPF     = SORGHUM, FARM PRICE, OCT YR, $/BU
   WHEPF     = WHEAT, AVERAGE PRICE RECEIVED BY FARMERS, JUL-JE, US, $/BU
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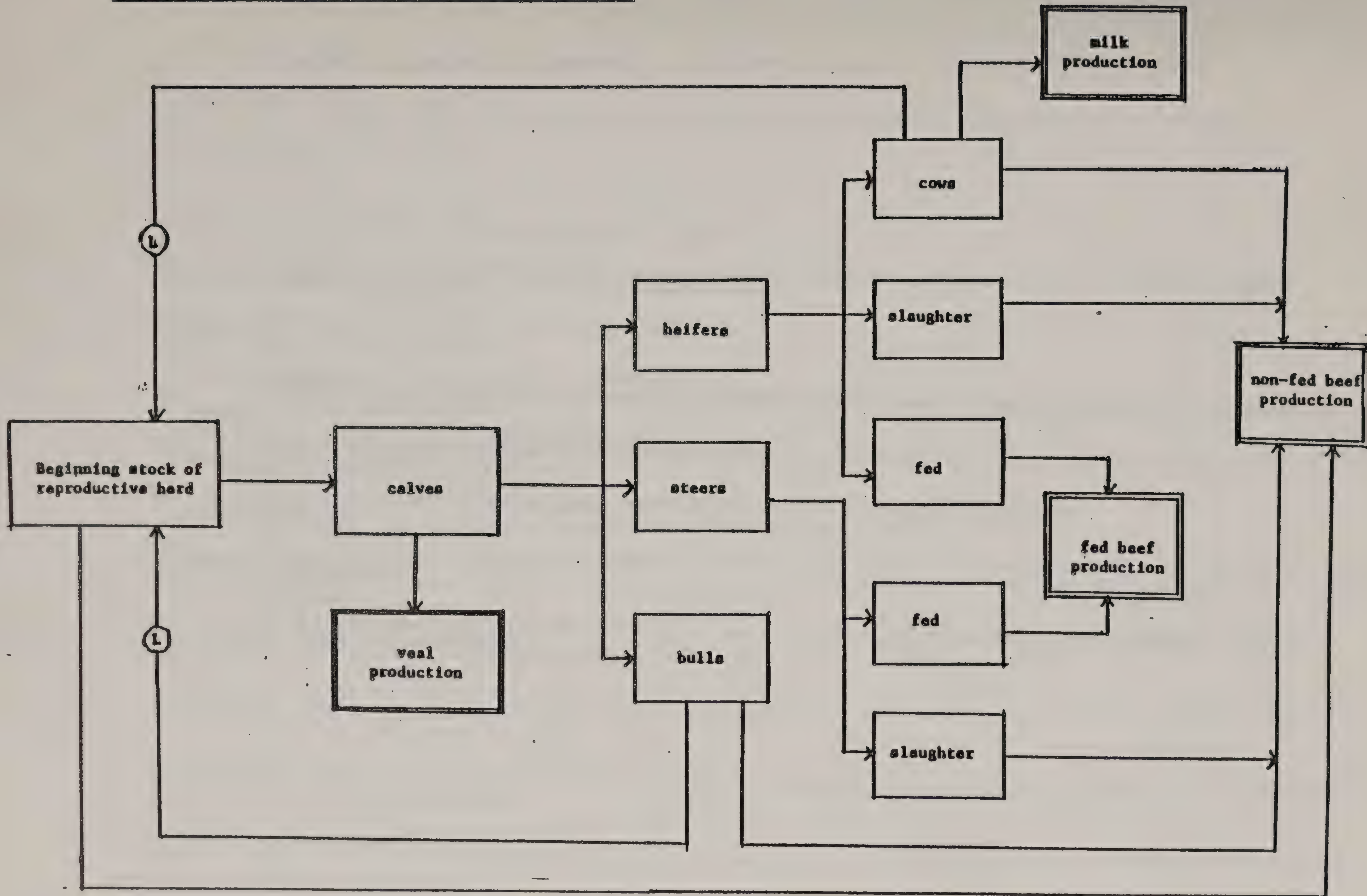
Table 1: Commodities and Herds in the Beef-Milk Sector



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   NUMBER OF CALVES SLAUGHTERED:
16)       CALKS = 12.4667-0.40575*(CALSC(-1)-CALDD(-1)-CALKS(-1))+171.632*CORPF/CATPFFD-3.1987*DUM73-4.46092*
          DUM74

   NUMBER OF CALVES BORN:
17)       CALSC = 3.80891+0.7181*(COWSNBE+COWSNMC-COWSNBE(-1)-COWSNMC(-1))+0.91255*CALSC(-1)

   VEAL PRODUCTION:
18)       VEAAT = -40.3354+119.665*CALKS-0.23108*VEAAT(-1)+255.898*CATPFFD(-1)/CALPF(-1)

   ENDING STOCKS OF BEEF:
19)       BEEHT = -65.4529+0.03088*BEEAP-0.01232*BEEAP(-1)

   AVERAGE YIELD OF MILK PER COW:
20)       COWYILD = 2.99768+6.35387*PCOWIMP+0.63117*COWYILD(-1)+0.08893*MILPF/CORPF-0.06783*(2*COWSNMC+COWSEMC-
          COWKSMC)/2

   TOTAL MILK PRODUCTON:
21)       MILAP = COWYILD*(2*COWSNMC+COWSEMC-COWKSMC)/2

   ALTERNATIVELY INSTEAD OF (20) AND (21) WHERE MILAP2=MILAP:
22)       MILAP2 = 11.5294+57.322*PCOWIMP+0.64049*MILAP(-1)+1.08354*MILPF/CORPF+1.29201*(2*COWSNMC+COWSEMC-
          COWKSMC)/2
```

EQUATIONS

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   FEED PRICE INDEX:
 1:      FCCFC == 0.6046*CORPF+0.1428*SORPF+0.0106*OATPF+0.0877*BARPF+0.0004*WHEPF+0.1539*SOMPF

   COST INDEX IN BEEF PRODUCTION:
 2:      CV1 == 0.66*FCCFC+0.027*PTPCSOT+0.059*PTPW051+0.0541*PTWRHMP+0.039*PTFRMCP4+0.161*CATPFFE

   NUMBER OF BEEF COWS, JAN1:
 3:      COWSNBE = 0.98*COWSNBE(-1)+HEISBBE(-1)-COWKSNF(-1)

   NUMBER OF DAIRY COWS, JAN1:
 4:      COWSNMC = 0.98*COWSNMC(-1)+COWSEMC(-1)-COWKSMC(-1)

   NUMBER OF NON FED CATTLE SLAUGHTERED:
 5:      CATKSNF = COWKSNF+COWKSMC+SAHKS-SAHKSFD

   TOTAL PRODUCTION OF BEEF IN US:
 6:      BEEAP = BEEAPFD+BEEAPNF

   CALVES, HEIFERS AND STEER, NUMBER ON FARMS, JAN 1:
 7:      HAFCAV = HAFCAV(-1)+CALSC(-1)-SAHKS(-1)-CALDD(-1)-CALKS(-1)-HEISBBE(-1)-COWSEMC(-1)

   ADDITIONS OF HEIFERS TO THE BEEF HERD:
 8:      HEISBBE = -0.58308+0.18254*COWSNBE-0.1075*CATPFFD/CORPF+0.01934*CATPFFD(-1)/CORPF(-1)+0.07985*CATPFFD(
         -2)/CORPF(-2)+0.59107*PTDUM590

   ADDITIONS OF HEIFERS TO THE DAIRY HERD:
 9:      COWSEMC = -0.34989+0.15929*COWSNMC(-3)+2.31701*MILPF/CATPFNF

   NUMBER OF BEEF COWS SLAUGHTERED:
10:      COWKSNF = 1.46304+0.24441*COWSNBE-0.11995*CATPFFD(-1)/CORPF(-1)-0.14927*CATPFFD(-2)/CORPF(-2)+0.68377*
         PTDUM590

   NUMBER OF DAIRY COWS SLAUGHTER:
11:      COWKSMC = 0.45654-1.78209*COWSEMC+2.72397*COWSEMC(-1)-0.09157*MILPF/CORPF

   STEER AND HEIFER FED SLAUGHTERED:
12:      SAHKSFD = -11.8509+0.11555*CATPFFD/CORPF+0.2342*CATPFFD(-1)/CORPF(-1)+0.40366*(CALSC(-2)-CALDD(-2)-
         CALKS(-2))+0.56909*SAHKSFD(-1)

   NUMBER OF STEER AND HEIFER SLAUGHTERED:
13:      SAHKS = 3.96644-0.69279*PTDUM590-0.10003*CATPFFD/CORPF+0.31445*(CALSC(-2)-CALDD(-2)-CALKS(-2))-3.26567
         *DUM73+0.53928*SAHKS(-1)

   TOTAL FED BEEF PRODUCED:
14:      BEEAPFD = -2958+583.754*SAHKSFD+231.502*CATPFFE/CV1+639.937*CATPFFE(-1)/CV1(-1)-288.62*CATPFFE(-2)/CV1
         (-2)+0.11196*BEEAPFD(-1)

   TOTAL NON FED BEEF PRODUCED:
15:      BEEAPNF = 458.908+536.102*CATKSNF-440.165*PTDUM590-31.9566*CATPFFD/CORPF
```

SIMULATION OUTPUT BY VARIABLE

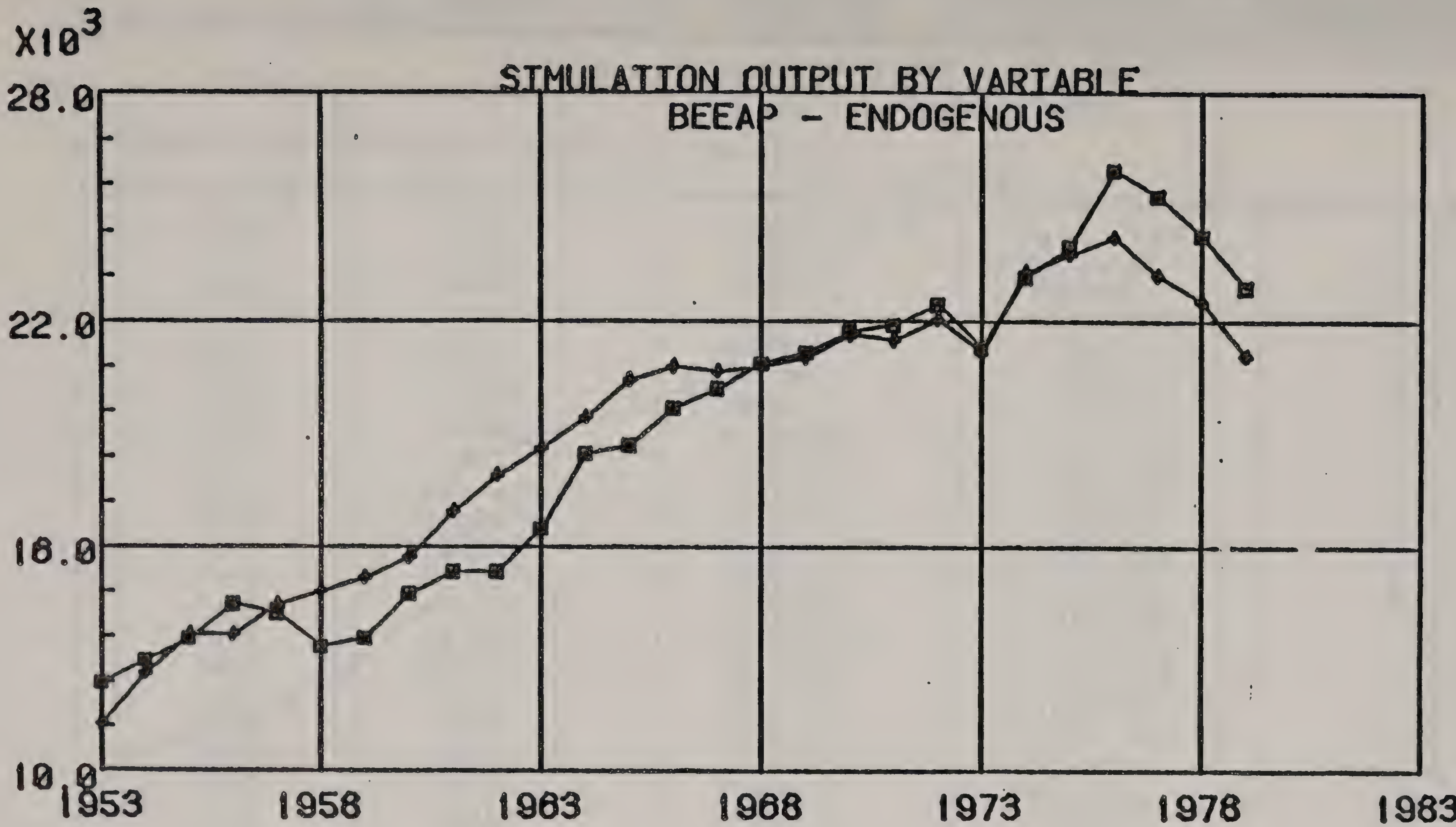
BEEAP - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	12407.	11300.7	-1106.28	-8.91656
1954	12963.	12613.4	-349.637	-2.69719
1955	13569.	13681.1	112.059	0.825842
1956	14462.	13665.9	-796.074	-5.50459
1957	14202.	14425.5	223.453	1.57339
1958	13330.	14799.1	1469.12	11.0212
1959	13580.	15175.7	1595.71	11.7504
1960	14753.	15682.3	929.254	6.29874
1961	15327.	16948.5	1621.47	10.5792
1962	15324.	17879.	2554.97	16.673
1963	16456.	18609.6	2153.58	13.0869
1964	18456.	19425.9	969.902	5.25521
1965	18727.	20437.1	1710.07	9.13157
1966	19726.	20803.7	1077.73	5.46352
1967	20219.	20640.4	421.426	2.0843
1968	20880.	20796.9	-83.1328	-0.398146
1969	21158.	21038.6	-119.375	-0.564207
1970	21685.	21631.1	-53.8555	-0.248354
1971	21902.	21496.1	-405.871	-1.85312
1972	22419.	22039.9	-379.098	-1.69097
1973	21277.	21178.1	-98.8828	-0.46474
1974	23138.	23306.1	168.074	0.726399
1975	23976.	23760.8	-215.234	-0.897707
1976	25969.	24198.3	-1770.69	-6.81848
1977	25279.	23204.7	-2074.27	-8.20551
1978	24242.	22519.3	-1722.66	-7.10608
1979	22875.	21061.5	-1813.46	-7.92771

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

BEEAP - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	18826.	18974.8	148.826	1.52504
RMS	19293.	19334.3	1228.07	7.10078



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

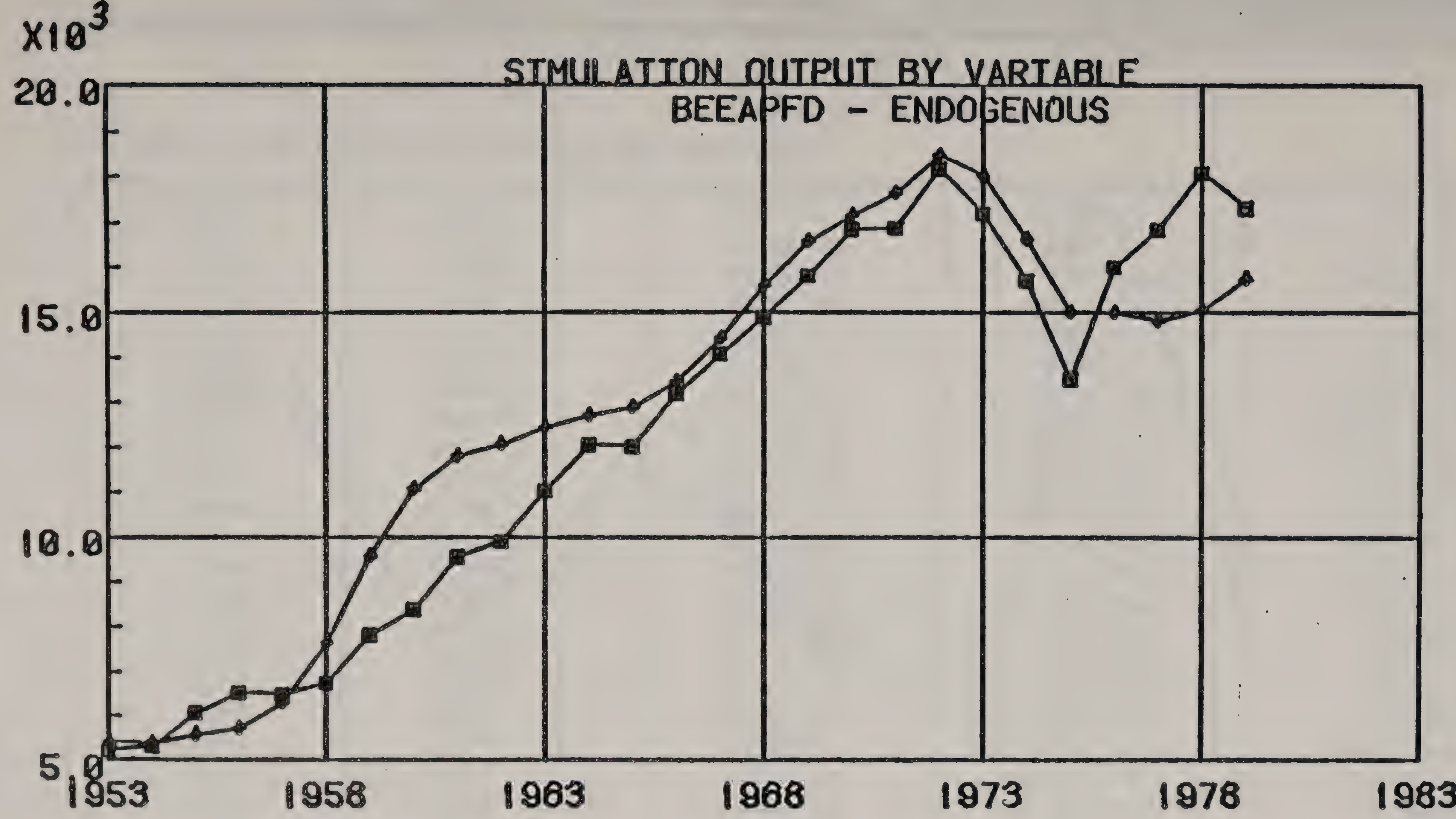
BEEAPFD - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	5254.	5423.8	169.797	3.23176
1954	5319.	5389.11	70.1055	1.31802
1955	6068.	5575.	-493.	-8.12458
1956	6536.	5737.28	-798.719	-12.2203
1957	6512.	6308.38	-203.621	-3.12686
1958	6760.	7642.77	882.766	13.0587
1959	7818.	9549.1	1731.1	22.1425
1960	8392.	11091.5	2699.52	32.1677
1961	9561.	11803.2	2242.2	23.4515
1962	9896.	12066.6	2170.64	21.9345
1963	11038.	12461.7	1423.67	12.8979
1964	12049.	12710.9	661.855	5.49303
1965	12038.	12886.1	848.141	7.04552
1966	13207.	13449.2	242.207	1.83393
1967	14075.	14397.8	322.82	2.29357
1968	14909.	15575.1	666.082	4.46765
1969	15830.	16581.3	751.27	4.74586
1970	16849.	17148.8	299.777	1.7792
1971	16887.	17647.7	760.672	4.50448
1972	18155.	18448.9	293.852	1.61857
1973	17181.	18001.3	820.285	4.77437
1974	15712.	16606.	894.004	5.68994
1975	13512.	14993.	1480.96	10.9604
1976	16000.	14976.4	-1023.62	-6.3976
1977	16850.	14792.	-2058.	-12.2137
1978	18100.	15055.8	-3044.18	-16.8186
1979	17300.	15732.6	-1567.44	-9.06033

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

BEEAPFD - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	12289.2	12668.5	379.376	4.34989
RMS	13041.1	13328.	1326.94	12.1985



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

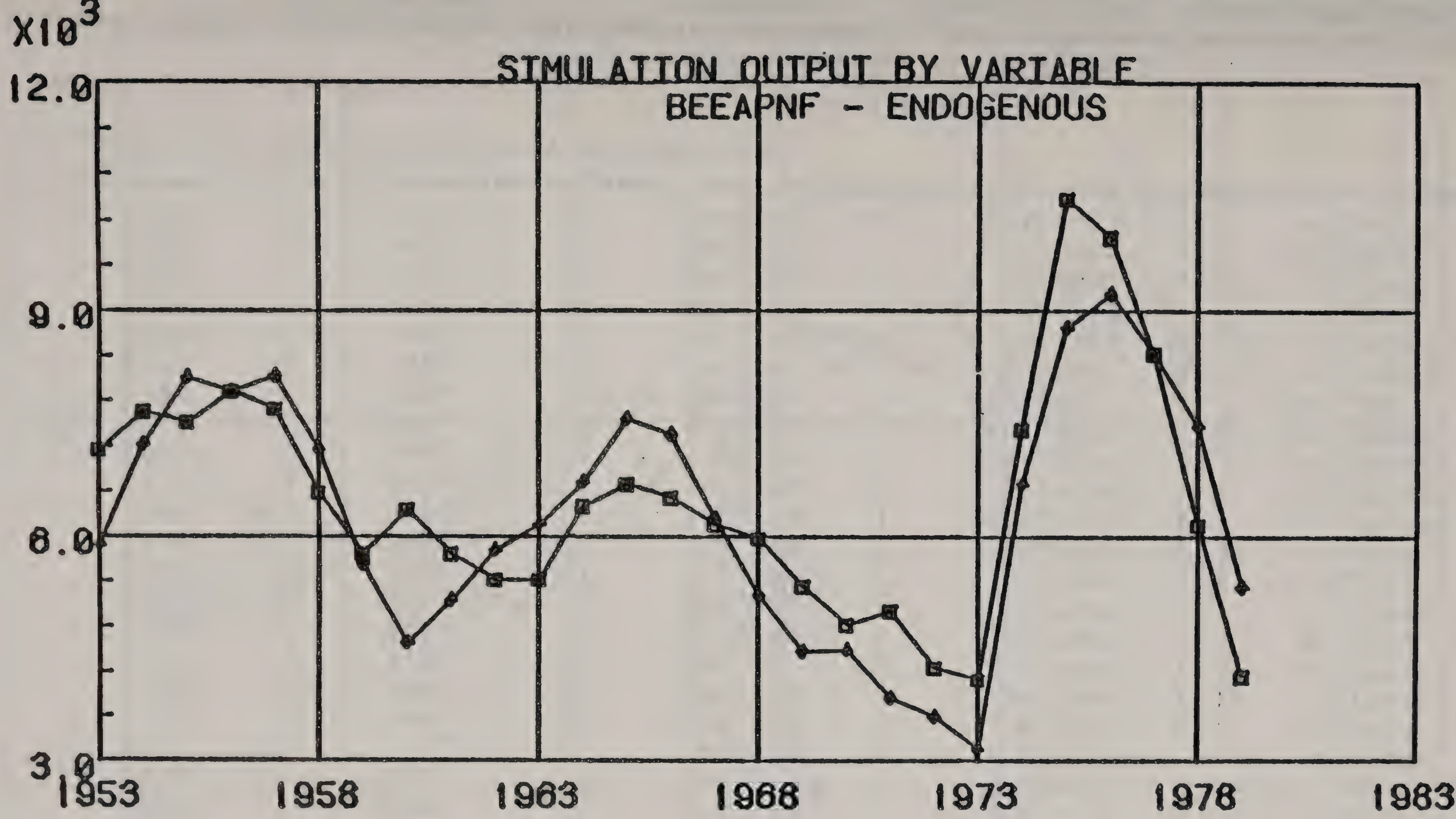
BEEAPNF - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	7153.	5876.93	-1276.07	-17.8397
1954	7644.	7224.26	-419.742	-5.49113
1955	7501.	8106.06	605.059	8.06637
1956	7926.	7928.64	2.64453	0.033365
1957	7690.	8117.07	427.074	5.55363
1958	6570.	7156.36	586.359	8.9248
1959	5762.	5626.61	-135.391	-2.34972
1960	6361.	4590.74	-1770.26	-27.8299
1961	5766.	5145.27	-620.73	-10.7654
1962	5428.	5812.34	384.336	7.08061
1963	5418.	6147.91	729.906	13.4719
1964	6407.	6715.05	308.047	4.80797
1965	6689.	7550.93	861.93	12.8858
1966	6519.	7354.53	835.527	12.8168
1967	6144.	6242.61	98.6055	1.60491
1968	5971.	5221.79	-749.215	-12.5476
1969	5328.	4457.36	-870.645	-16.3409
1970	4836.	4482.37	-353.633	-7.31251
1971	5015.	3848.46	-1166.54	-23.2611
1972	4264.	3591.05	-672.948	-15.7821
1973	4096.	3176.83	-919.168	-22.4406
1974	7426.	6700.07	-725.93	-9.77551
1975	10464.	8767.8	-1696.2	-16.2098
1976	9969.	9221.93	-747.074	-7.49397
1977	8429.	8412.73	-16.2695	-0.193018
1978	6142.	7463.52	1321.52	21.5161
1979	4146.	5328.97	1182.97	28.5329

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

BEEAPNF - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	6483.85	6306.2	-177.624	-2.6051
RMS	[illegible]	[illegible]	[illegible]	[illegible]



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

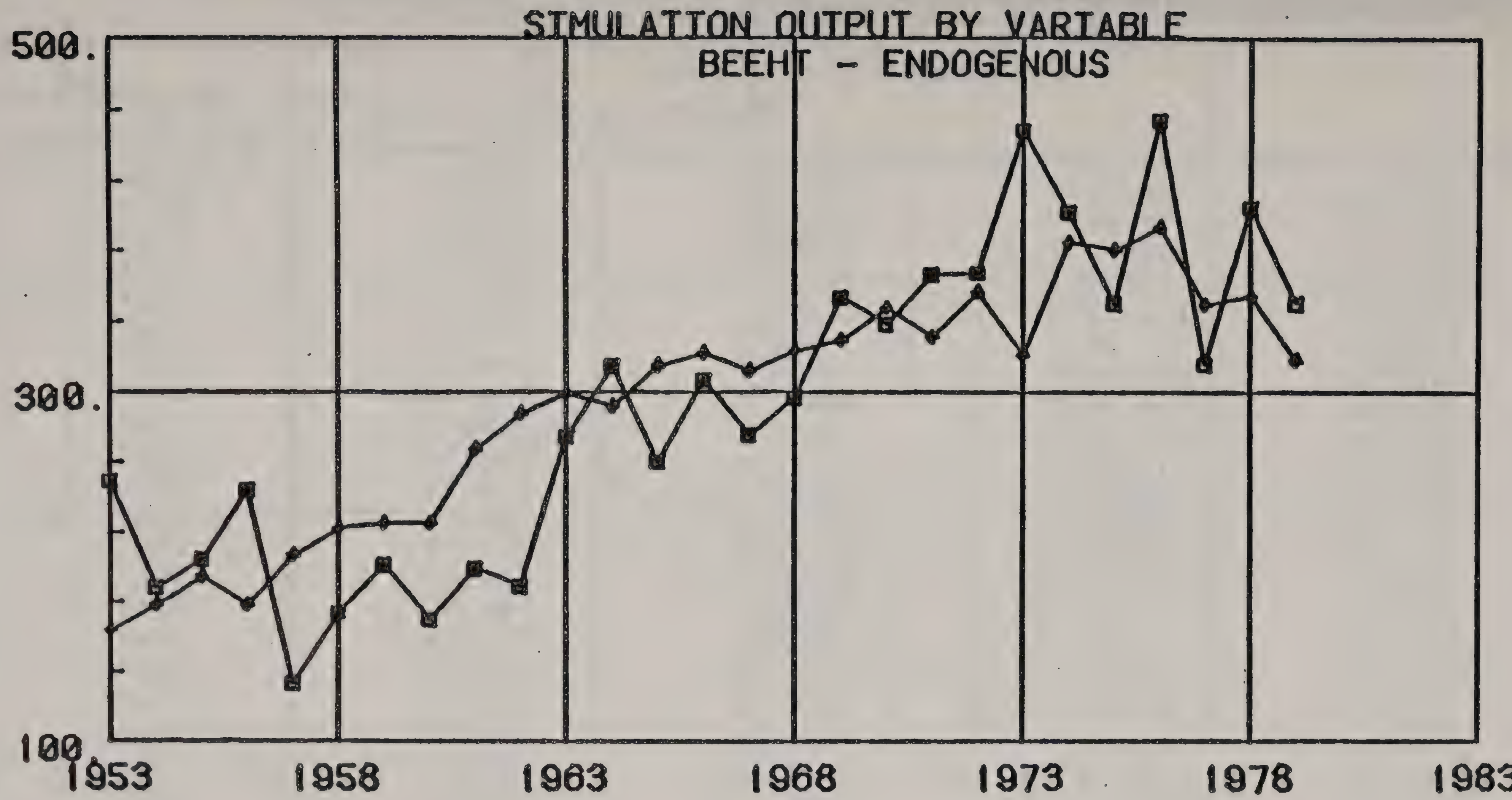
BEEHT - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	249.	164.461	-84.5387	-33.9513
1954	188.	178.402	-9.59825	-5.10545
1955	205.	194.57	-10.4304	-5.088
1956	244.	178.733	-65.2665	-26.7486
1957	134.	207.043	73.0426	54.5094
1958	174.	221.57	47.5702	27.3392
1959	202.	225.177	23.1772	11.4738
1960	170.	224.273	54.2729	31.9252
1961	200.	267.537	67.5366	33.7683
1962	189.	287.455	98.4553	52.0928
1963	274.	298.102	24.1016	8.79618
1964	315.	291.51	-23.4897	-7.45706
1965	260.	314.197	54.1965	20.8448
1966	307.	321.722	14.7219	4.79541
1967	275.	311.768	36.7681	13.3702
1968	296.	322.264	26.2644	8.87311
1969	353.	328.704	-24.2961	-6.88276
1970	338.	347.097	9.09741	2.69154
1971	366.	330.774	-35.2256	-9.62447
1972	367.	356.173	-10.8274	-2.95024
1973	448.	320.92	-127.08	-28.366
1974	402.	384.66	-17.3401	-4.31345
1975	350.	380.392	30.3921	8.68345
1976	454.	393.769	-60.2307	-13.2667
1977	316.	349.257	33.2568	10.5243
1978	405.	353.754	-51.2456	-12.6532
1979	350.	318.138	-31.8621	-9.10344

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

BEEHT - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	290.037	291.57	1.53416	4.59914



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

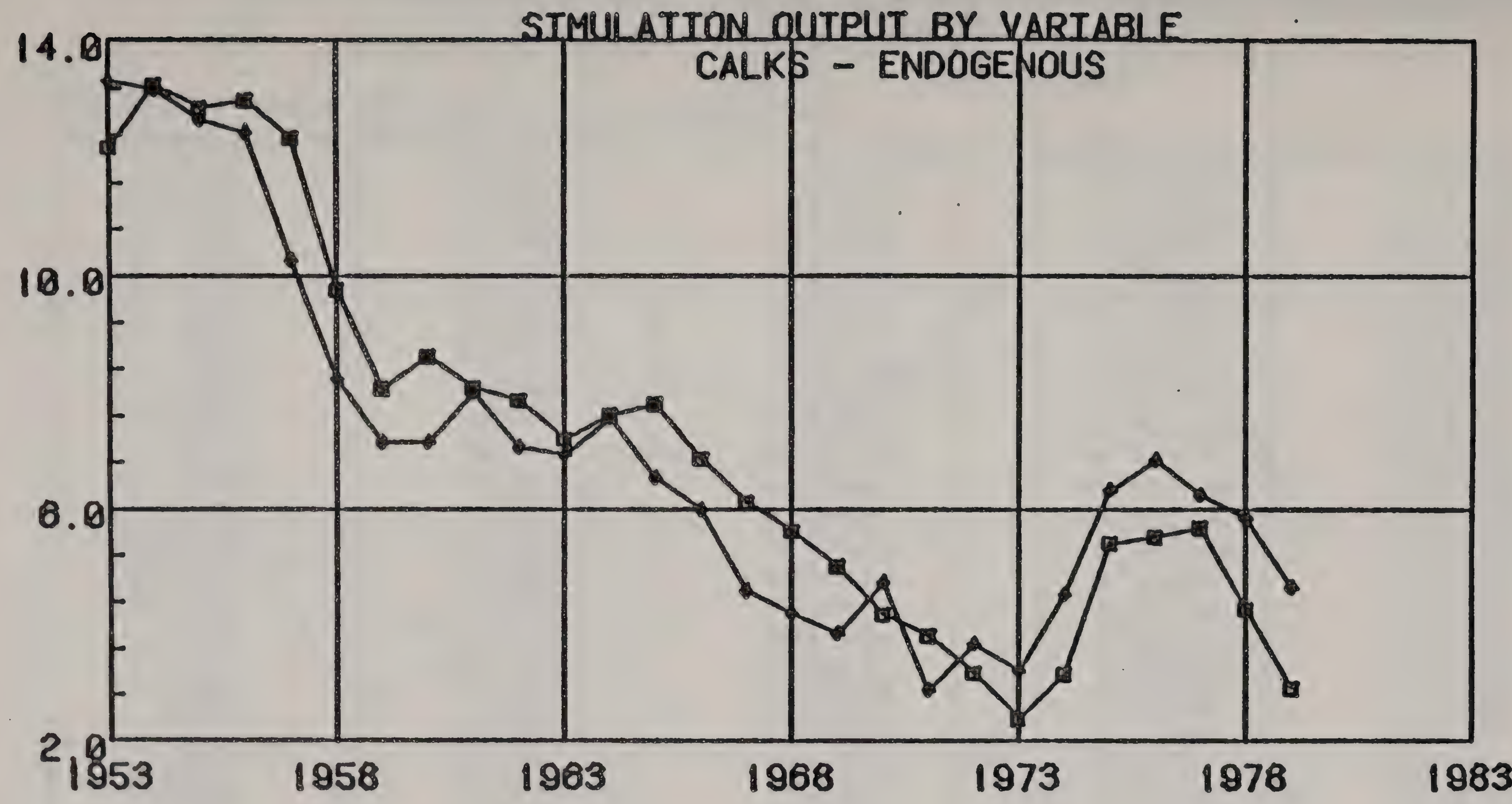
CALKS - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	12.2	13.3266	1.12657	9.23415
1954	13.27	13.1756	-0.094392	-0.711317
1955	12.864	12.643	-0.221015	-1.71809
1956	12.999	12.4365	-0.56252	-4.32741
1957	12.353	10.2471	-2.10592	-17.0478
1958	9.738	8.22471	-1.51329	-15.5401
1959	8.072	7.13193	-0.940065	-11.646
1960	8.615	7.14175	-1.47325	-17.1009
1961	8.08	7.98246	-0.09754	-1.20718
1962	7.857	7.03365	-0.823348	-10.4792
1963	7.204	6.92353	-0.280474	-3.8933
1964	7.632	7.55718	-0.074817	-0.980303
1965	7.788	6.5172	-1.2708	-16.3174
1966	6.863	5.98157	-0.881427	-12.8432
1967	6.11	4.59812	-1.51188	-24.7443
1968	5.616	4.21038	-1.40562	-25.0288
1969	5.011	3.85728	-1.15372	-23.0238
1970	4.203	4.73292	0.529918	12.6081
1971	3.825	2.8835	-0.941495	-24.6142
1972	3.201	3.66886	0.467863	14.6161
1973	2.404	3.222	0.817998	34.0265
1974	3.175	4.535	1.36	42.8347
1975	5.406	6.32472	0.918717	16.9944
1976	5.527	6.84326	1.31626	23.815
1977	5.692	6.22716	0.535162	9.402
1978	4.302	5.82046	1.51846	35.2967
1979	2.927	4.63646	1.70946	58.4031

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

CALKS - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	7.14569	6.95862	-0.18708	1.70399



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

□	#1	ACTUAL
◇	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

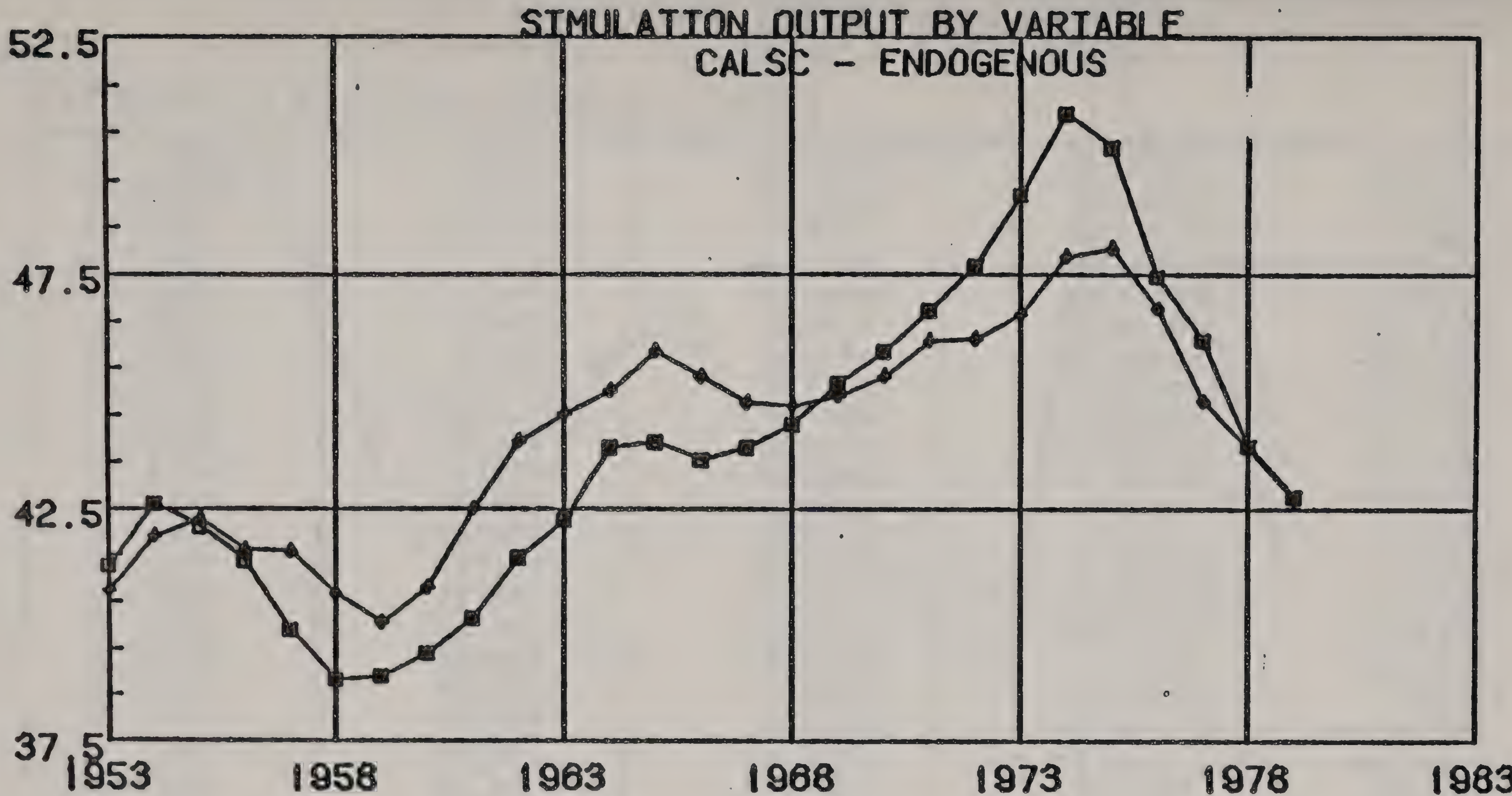
CALSC - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_FR	SIMULATE_PCER
1953	41.261	40.7488	-0.512207	-1.24138
1954	42.601	41.9272	-0.673813	-1.58168
1955	42.112	42.2598	0.147842	0.35107
1956	41.376	41.6064	0.230438	0.556936
1957	39.905	41.5703	1.66525	4.17304
1958	38.86	40.6813	1.82133	4.68691
1959	38.938	40.0596	1.12155	2.88035
1960	39.416	40.8085	1.39247	3.53276
1961	40.18	42.4739	2.29391	5.7091
1962	41.441	43.9213	2.48033	5.98521
1963	42.268	44.5117	2.24374	5.30837
1964	43.809	45.0248	1.21582	2.77527
1965	43.922	45.8639	1.94188	4.4212
1966	43.537	45.3099	1.77289	4.07214
1967	43.803	44.7498	0.946854	2.16162
1968	44.315	44.695	0.38002	0.857543
1969	45.177	44.895	-0.281998	-0.624206
1970	45.871	45.3283	-0.54274	-1.18319
1971	46.738	46.087	-0.650986	-1.39284
1972	47.682	46.1332	-1.5488	-3.24818
1973	49.194	46.6595	-2.53448	-5.15202
1974	50.873	47.8611	-3.01195	-5.92052
1975	50.183	48.0337	-2.14929	-4.28291
1976	47.44	46.7505	-0.689514	-1.45344
1977	46.088	44.7913	-1.29674	-2.81361
1978	43.839	43.7508	-0.088196	-0.201181
1979	42.752	42.7074	-0.044601	-0.104326

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

CALSC - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	43.8362	44.0447	[illegible]	[illegible]



TIME BOUNDS: 1953 TO 1979

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

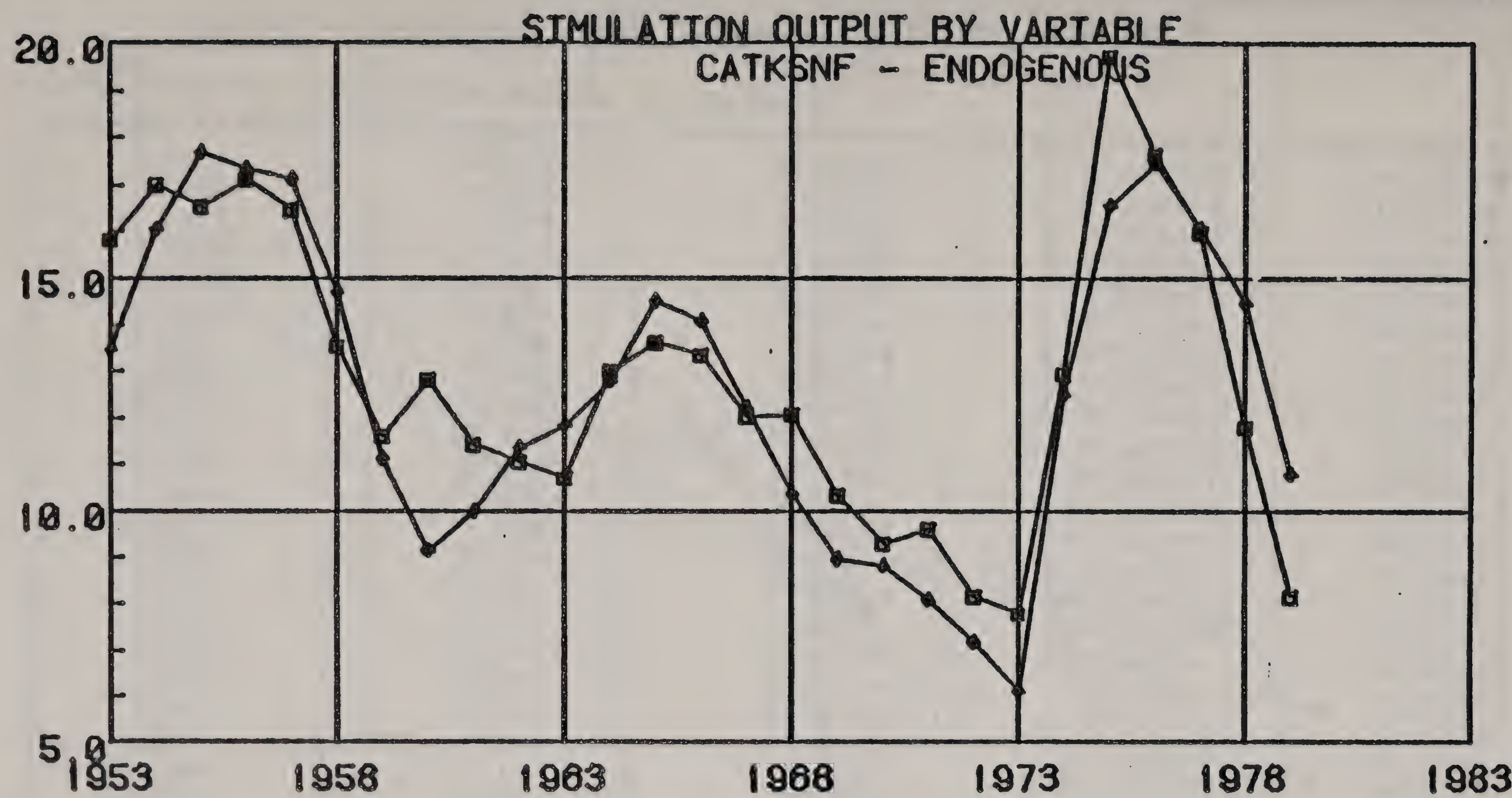
CATKSNF - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	15.817	13.4519	-2.36507	-14.9527
1954	16.996	16.0277	-0.968338	-5.69744
1955	16.516	17.672	1.15598	6.99912
1956	17.113	17.3277	0.214676	1.25446
1957	16.445	17.1122	0.667206	4.05719
1958	13.524	14.6759	1.15189	8.51737
1959	11.597	11.1217	-0.47531	-4.09856
1960	12.829	9.1539	-3.6751	-28.6468
1961	11.404	9.99715	-1.40685	-12.3365
1962	11.054	11.3404	0.286363	2.59058
1963	10.685	11.8308	1.14583	10.7237
1964	13.008	12.7656	-0.242421	-1.86363
1965	13.621	14.4791	0.858126	6.30001
1966	13.349	14.0773	0.728301	5.45585
1967	12.024	12.2283	0.204317	1.69924
1968	12.062	10.3425	-1.7195	-14.2555
1969	10.334	8.96094	-1.37306	-13.2868
1970	9.314	8.80568	-0.508321	-5.4576
1971	9.591	8.09044	-1.50056	-15.6455
1972	8.173	7.18991	-0.983089	-12.0285
1973	7.797	6.11096	-1.68604	-21.6242
1974	12.932	12.4686	-0.463418	-3.5835
1975	19.701	16.5456	-3.15536	-16.0163
1976	17.614	17.4301	-0.183853	-1.04379
1977	15.966	16.028	0.062	0.388327
1978	11.812	14.4525	2.64047	22.3541
1979	8.148	10.7934	2.64544	32.4674

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

CATKSNF - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	12.9417	12.6103	-0.331323	-2.50851
RMS	13.3139	13.0377	1.53357	13.1569
STD-DEV	[illegible]	[illegible]	[illegible]	[illegible]



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

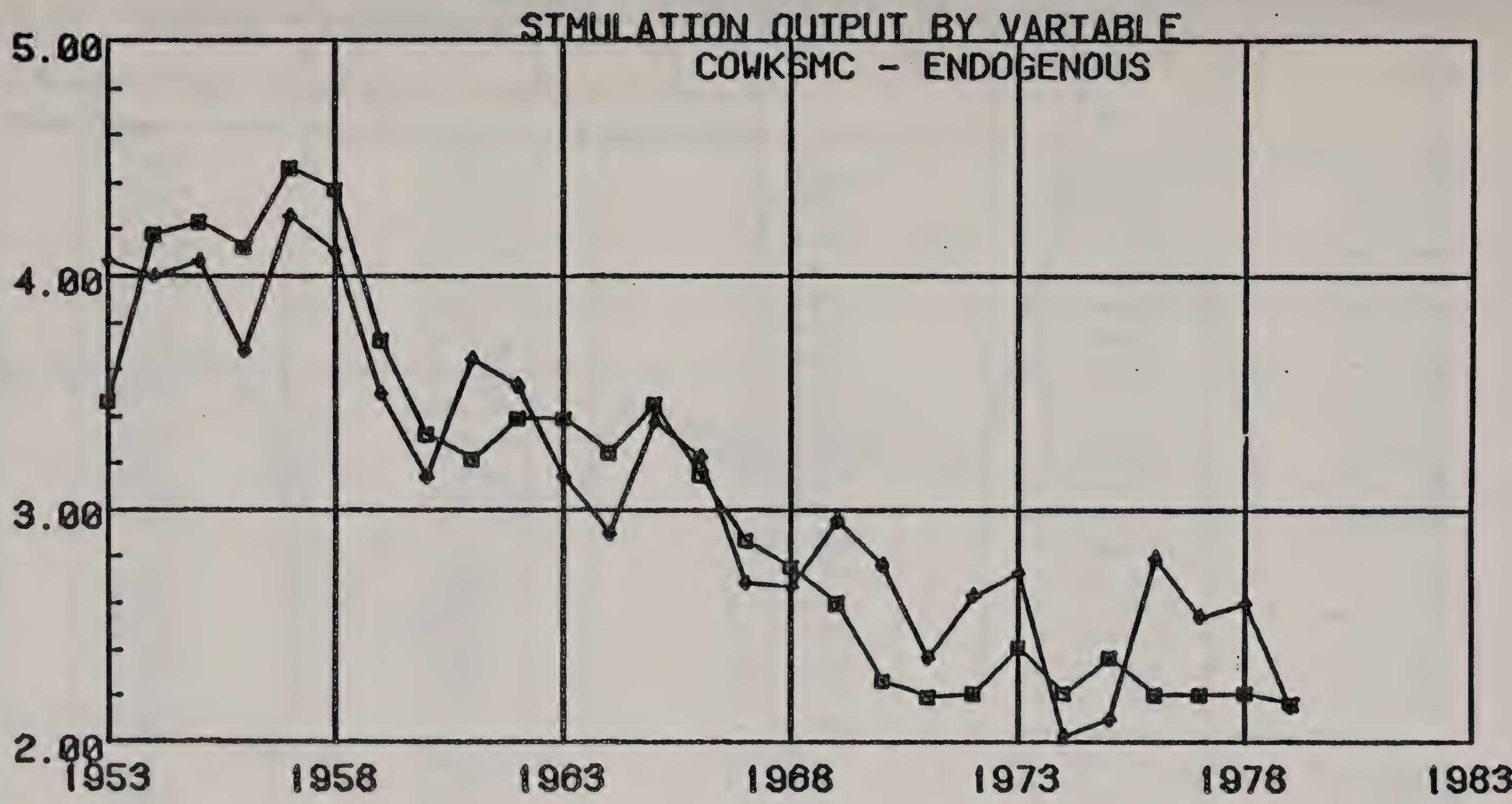
COWKSMC - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	3.465	4.061	0.596002	17.2006
1954	4.181	3.99948	-0.181524	-4.34165
1955	4.233	4.06087	-0.172126	-4.06628
1956	4.127	3.67501	-0.451985	-10.9519
1957	4.456	4.25271	-0.203288	-4.56212
1958	4.369	4.10387	-0.265128	-6.06839
1959	3.723	3.49466	-0.228343	-6.13331
1960	3.319	3.13955	-0.179449	-5.40672
1961	3.213	3.64047	0.427465	13.3042
1962	3.387	3.52796	0.140957	4.1617
1963	3.391	3.14162	-0.24938	-7.35418
1964	3.248	2.8946	-0.353405	-10.8807
1965	3.45	3.37338	-0.07662	-2.22087
1966	3.145	3.22646	0.08146	2.59014
1967	2.864	2.68755	-0.176446	-6.16082
1968	2.751	2.67299	-0.078008	-2.83561
1969	2.602	2.94857	0.346571	13.3194
1970	2.268	2.76385	0.495849	21.8628
1971	2.201	2.36754	0.16654	7.56656
1972	2.215	2.63445	0.419451	18.9368
1973	2.416	2.73438	0.318378	13.1779
1974	2.216	2.0347	-0.181302	-8.1815
1975	2.371	2.10208	-0.268918	-11.342
1976	2.205	2.78987	0.58487	26.5247
1977	2.208	2.53799	0.329989	14.9452
1978	2.219	2.59884	0.379845	17.1178
1979	2.174	2.15372	-0.020283	-0.932969

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

COWKSMC - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	3.05247	3.09696	0.044488	2.93589
RMS	3.14517	3.16296	0.31206	11.6451



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

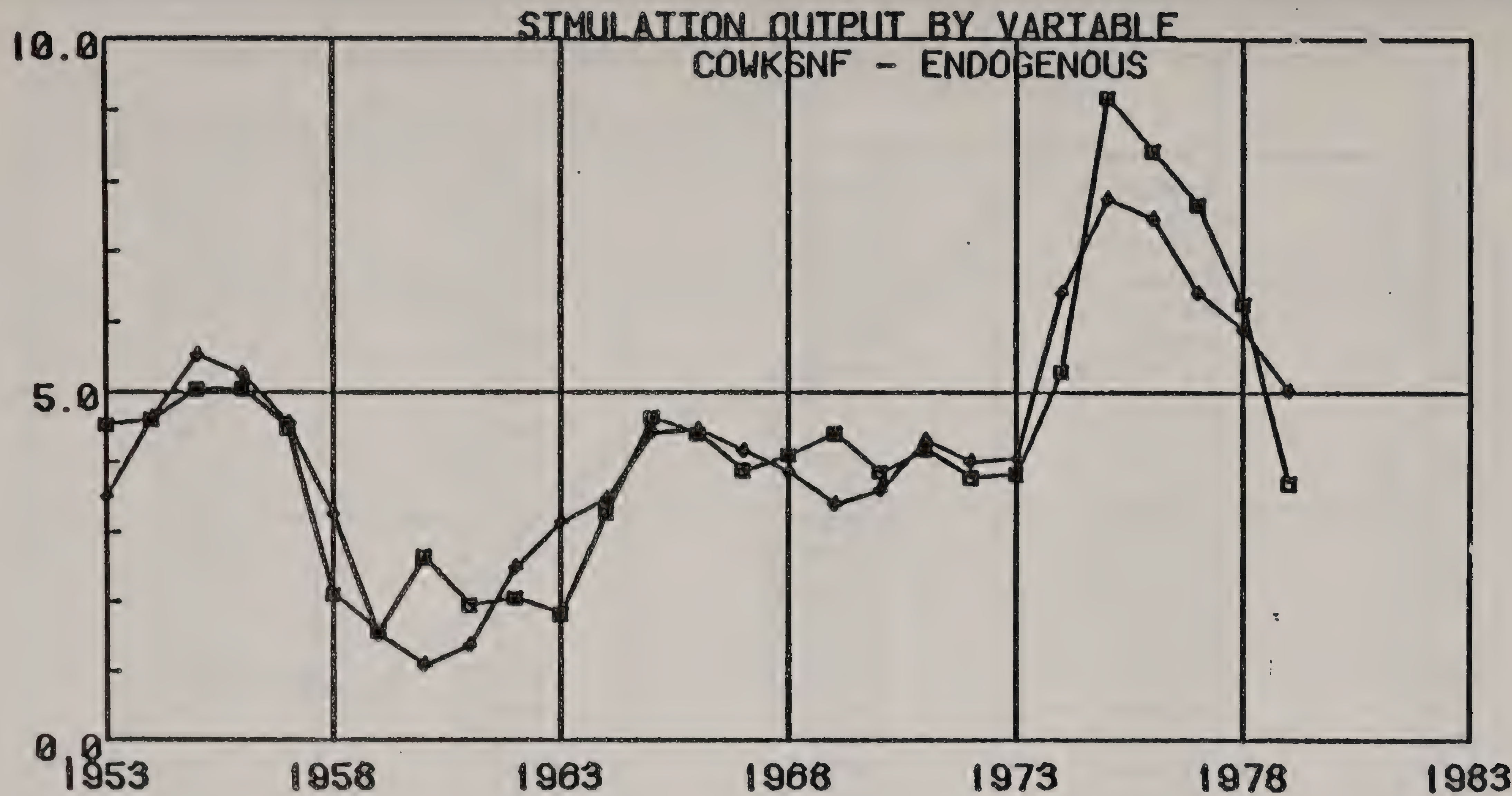
COWKSNF - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	4.535	3.48798	-1.04702	-23.0875
1954	4.619	4.62822	0.00922	0.199613
1955	5.042	5.51765	0.475648	9.43371
1956	5.027	5.24584	0.218839	4.35326
1957	4.474	4.54788	0.073876	1.65124
1958	2.106	3.24988	1.14388	54.3154
1959	1.577	1.5262	-0.050797	-3.22108
1960	2.631	1.10675	-1.52425	-57.9343
1961	1.964	1.37104	-0.592957	-30.1913
1962	2.064	2.47525	0.411247	19.9248
1963	1.835	3.14754	1.31254	71.528
1964	3.279	3.46967	0.190674	5.815
1965	4.629	4.39948	-0.229522	-4.95834
1966	4.397	4.44628	0.04928	1.12077
1967	3.876	4.16427	0.288267	7.43723
1968	4.099	3.85609	-0.24291	-5.92609
1969	4.411	3.39403	-1.01697	-23.0552
1970	3.845	3.58847	-0.256534	-6.67187
1971	4.174	4.31789	0.143888	3.44723
1972	3.777	4.00239	0.225391	5.96747
1973	3.832	4.05007	0.218073	5.69084
1974	5.298	6.39424	1.09624	20.6916
1975	9.186	7.73703	-1.44897	-15.7736
1976	8.414	7.45637	-0.957627	-11.3814
1977	7.656	6.39392	-1.26208	-16.4848
1978	6.251	5.8649	-0.3861	-6.17661
1979	3.698	5.01274	1.31474	35.5526

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

COWKSNF - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	4.32207	4.25377	-0.068294	1.56542
RMS	4.70028	4.55359	0.779249	24.7744



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

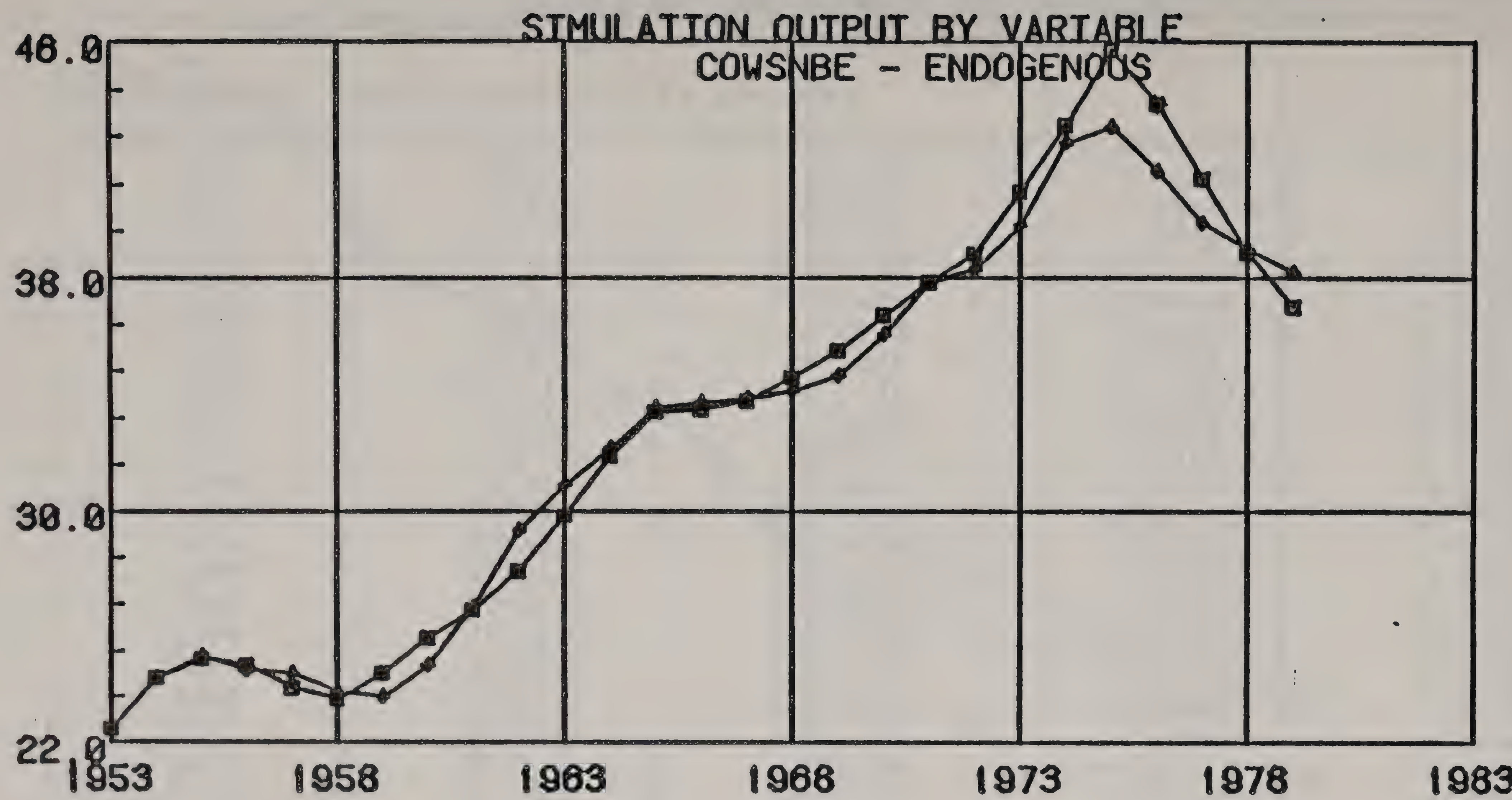
CONSEMC - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	4.116	3.98584	-0.130158	-3.16225
1954	4.176	3.96173	-0.21427	-5.13098
1955	4.099	3.88045	-0.218554	-5.3319
1956	4.002	3.96044	-0.041556	-1.03839
1957	3.9	3.72857	-0.171427	-4.39556
1958	3.714	3.46308	-0.250917	-6.75598
1959	3.517	3.38503	-0.131972	-3.75241
1960	3.412	3.45224	0.040236	1.17923
1961	3.261	3.29308	0.03208	0.983738
1962	3.209	3.12242	-0.086576	-2.69793
1963	3.112	3.07621	-0.035704	-1.1502
1964	2.987	3.15172	0.164715	5.51439
1965	2.868	2.99335	0.125353	4.37074
1966	2.67	2.82179	0.151788	5.68493
1967	2.529	2.81083	0.281834	11.1441
1968	2.448	2.80339	0.355389	14.5175
1969	2.394	2.64349	0.24949	10.4215
1970	2.328	2.52532	0.19732	8.47594
1971	2.306	2.5084	0.202401	8.77715
1972	2.297	2.41338	0.116384	5.06676
1973	2.323	2.26686	-0.056139	-2.41666
1974	2.365	2.43766	0.072659	3.07228
1975	2.452	2.62564	0.173636	7.08142
1976	2.375	2.47316	0.098163	4.13316
1977	2.333	2.36506	0.032059	1.37414
1978	2.338	2.17085	-0.16715	-7.14929
1979	2.362	2.10458	-0.257425	-10.8986

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

CONSEMC - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	2.95890	2.97868	0.019688	1.40432
RMS	3.03296	3.03423	0.172594	6.41198
STD_DEV	[illegible]	[illegible]	[illegible]	[illegible]



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

◘	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

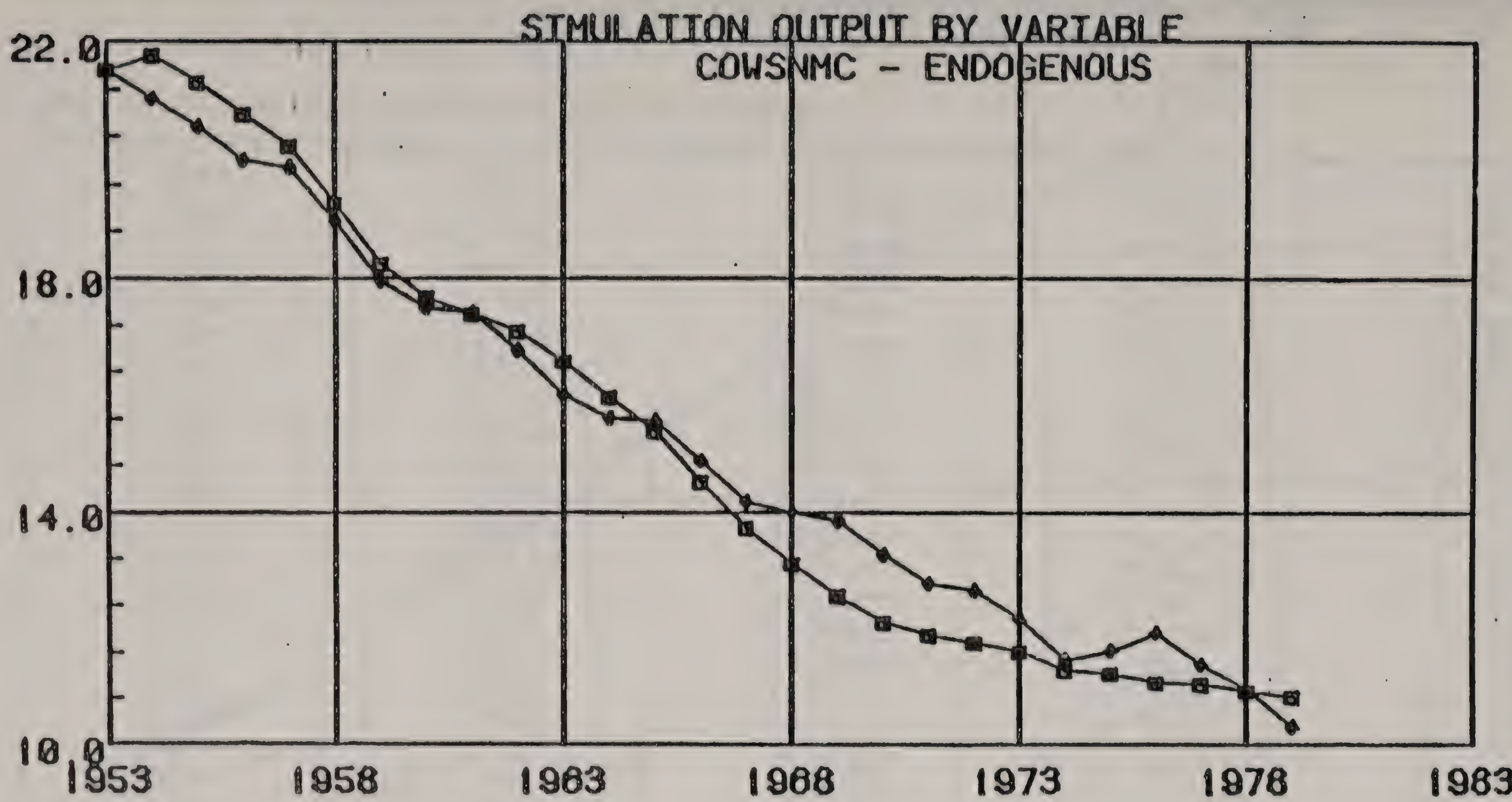
CUWSNBE - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	22.49	22.4895	-0.000519	-0.002307
1954	24.285	24.2947	0.009689	0.039898
1955	24.92	25.0181	0.098145	0.393838
1956	24.7	24.5425	-0.157516	-0.637718
1957	23.895	24.369	0.474014	1.98374
1958	23.53	23.811	0.280991	1.19418
1959	24.46	23.6149	-0.845078	-3.45494
1960	25.675	24.7004	-0.97464	-3.79606
1961	26.655	26.7216	0.066635	0.249991
1962	27.996	29.3015	1.30547	4.66304
1963	29.829	30.9084	1.07938	3.61855
1964	31.908	32.1245	0.216537	0.678631
1965	33.4	33.5269	0.126907	0.379962
1966	33.5	33.7276	0.227585	0.679358
1967	33.77	33.8632	0.093185	0.275941
1968	34.57	34.0921	-0.477859	-1.38229
1969	35.49	34.659	-0.831055	-2.34166
1970	36.689	36.0074	-0.681549	-1.85764
1971	37.878	37.7838	-0.094208	-0.248714
1972	38.81	38.2708	-0.539215	-1.38937
1973	40.932	39.7916	-1.14037	-2.786
1974	43.182	42.5539	-0.628143	-1.45464
1975	45.712	43.1449	-2.56708	-5.61576
1976	43.888	41.6125	-2.27548	-5.18475
1977	41.389	39.8285	-1.5605	-3.77033
1978	38.809	38.9305	0.121475	0.313008
1979	37.003	38.1487	1.14568	3.09617

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

CUWSNBE - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	32.7912	32.5124	-0.278797	-0.605772
RMS	33.541	33.1762	0.940996	2.53382
STD.DEV	[illegible]	[illegible]	[illegible]	[illegible]



TIME BOUNDS: 1953 TO 1979

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

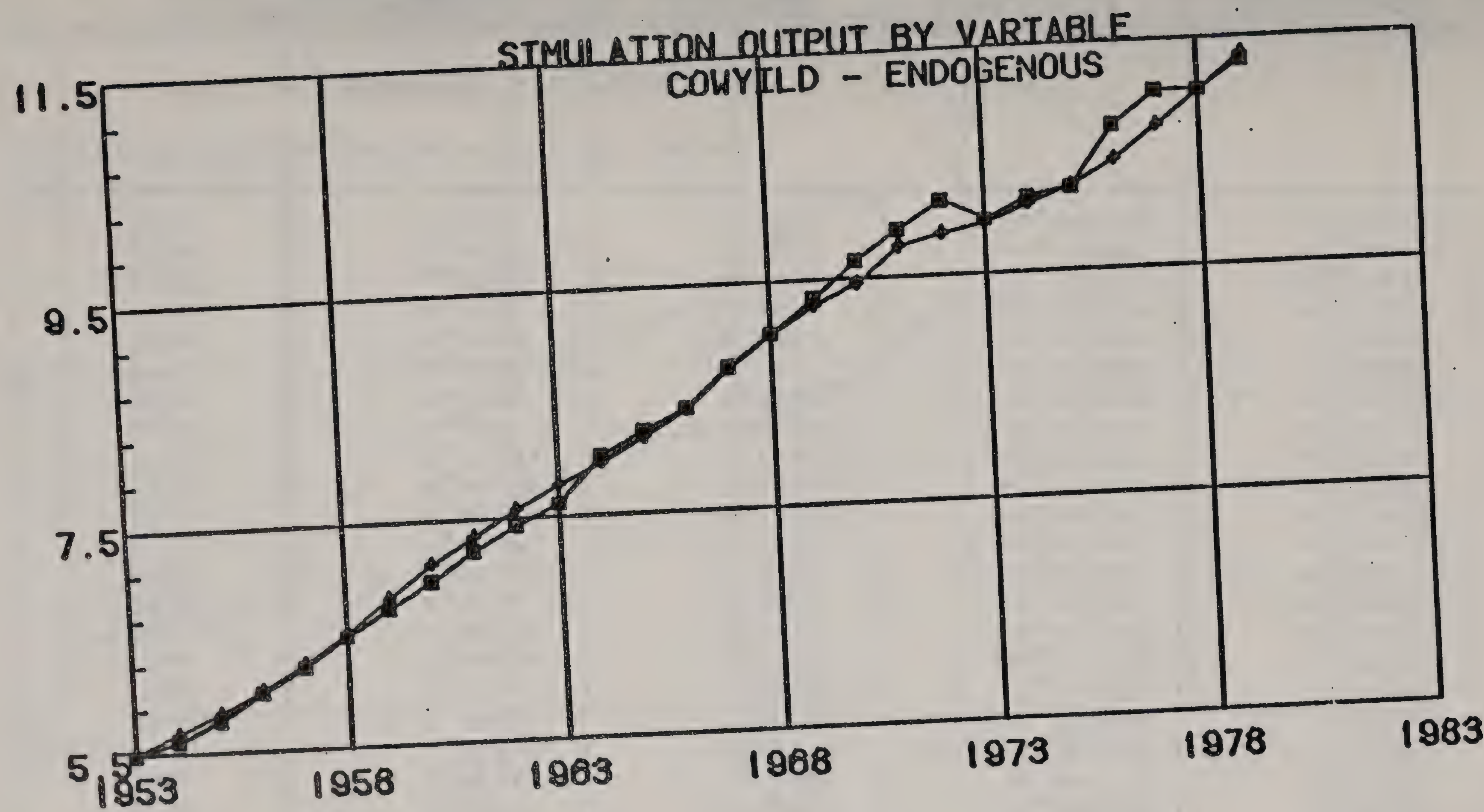
COWSNMC - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	21.54	21.54	-1.525879E-05	-7.083933E-05
1954	21.76	21.034	-0.725983	-3.33632
1955	21.32	20.5756	-0.744446	-3.49177
1956	20.76	19.9836	-0.776398	-3.73987
1957	20.22	19.8693	-0.350662	-1.73423
1958	19.26	18.9478	-0.31221	-1.62103
1959	18.22	17.928	-0.291992	-1.60259
1960	17.65	17.4598	-0.190186	-1.07754
1961	17.39	17.4233	0.033279	0.191371
1962	17.09	16.7274	-0.362595	-2.12168
1963	16.57	15.9873	-0.58269	-3.51693
1964	15.96	15.6022	-0.357845	-2.24214
1965	15.38	15.5472	0.167223	1.08728
1966	14.49	14.8562	0.36625	2.52761
1967	13.725	14.1544	0.429444	3.12892
1968	13.115	13.9946	0.879636	6.7071
1969	12.55	13.8451	1.29513	10.3198
1970	12.091	13.2631	1.17214	9.69436
1971	11.909	12.7594	0.850352	7.14042
1972	11.776	12.645	0.869026	7.37963
1973	11.622	12.1711	0.549058	4.7243
1974	11.297	11.4601	0.163118	1.44391
1975	11.22	11.6339	0.413877	3.68875
1976	11.087	11.9248	0.837794	7.55618
1977	11.035	11.3696	0.334552	3.03173
1978	10.939	10.9692	0.03023	0.276347
1979	10.839	10.3218	-0.51715	-4.7712

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

COWSNMC - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	15.2153	15.333	0.117737	1.46825
RMS	15.672	15.6981	0.604227	4.57049



TIME BOUNDS: 1953 TO 1979

SYMBOL	SCALE	NAME
◘	#1	ACTUAL
♦	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

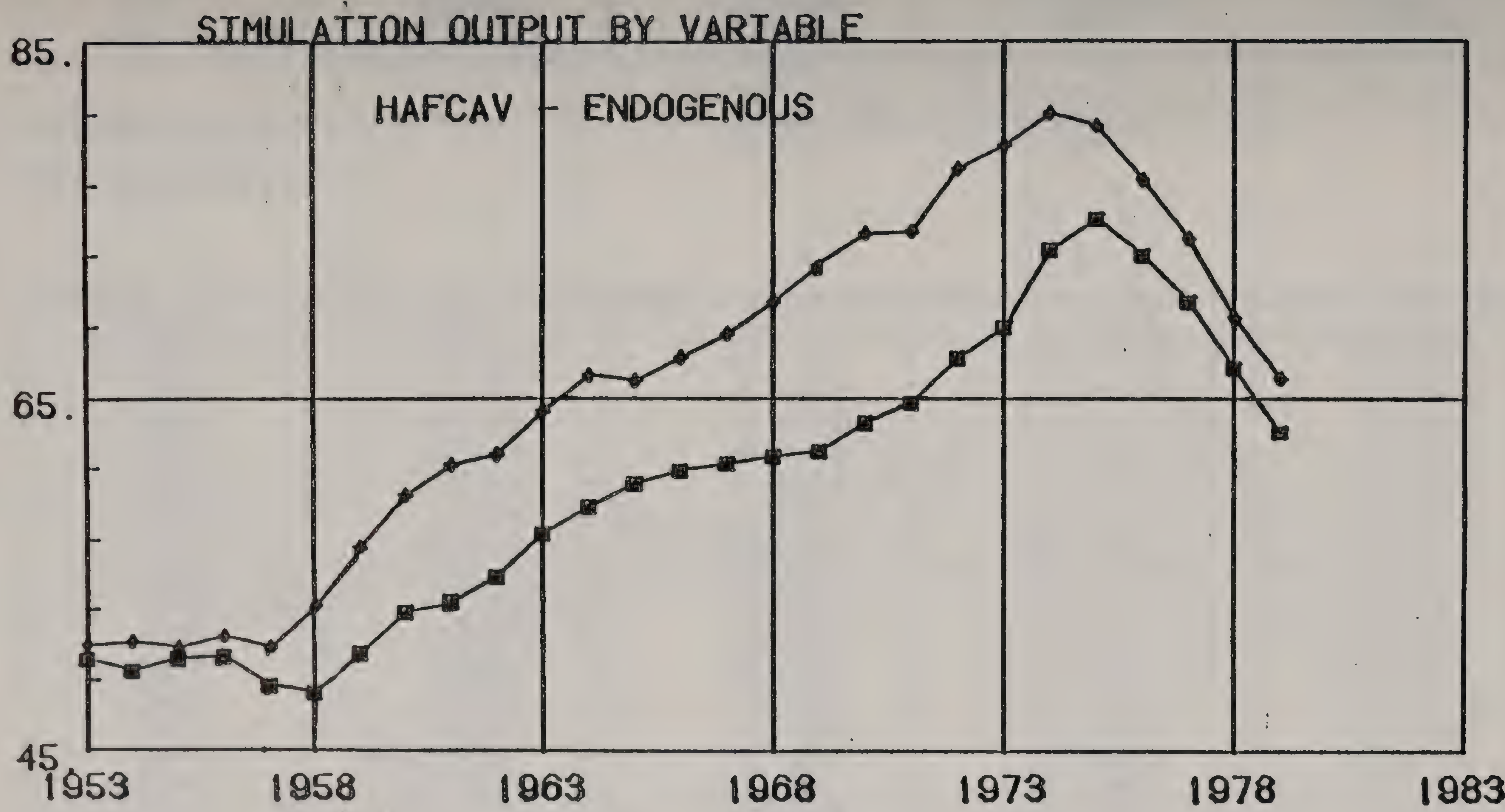
COWYILD - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	5.51193	5.52187	0.009945	0.180425
1954	5.62078	5.68737	0.06659	1.18472
1955	5.78953	5.85953	0.069997	1.20902
1956	6.03262	6.04669	0.014074	0.233304
1957	6.24953	6.28651	0.036981	0.591734
1958	6.50839	6.54094	0.032552	0.50015
1959	6.7334	6.82672	0.093313	1.38582
1960	6.95669	7.11481	0.158115	2.27285
1961	7.21874	7.34178	0.123047	1.70455
1962	7.4261	7.56357	0.137478	1.85128
1963	7.6201	7.78728	0.167178	2.19391
1964	8.02091	7.96146	-0.059452	-0.741213
1965	8.22984	8.16775	-0.062087	-0.754414
1966	8.4134	8.4066	-0.006803	-0.080854
1967	8.75767	8.7445	-0.01317	-0.150385
1968	9.0427	9.02761	-0.015097	-0.166949
1969	9.32895	9.27067	-0.05828	-0.624722
1970	9.65326	9.45442	-0.198838	-2.0598
1971	9.91231	9.76173	-0.150579	-1.51912
1972	10.157	9.86374	-0.293246	-2.88714
1973	9.9772	9.9527	-0.024501	-0.245568
1974	10.1645	10.093	-0.071505	-0.703471
1975	10.2424	10.2454	0.002995	0.029237
1976	10.7652	10.4631	-0.302124	-2.80648
1977	11.0564	10.7505	-0.305901	-2.76673
1978	11.0569	11.0431	-0.013751	-0.124366
1979	11.3073	11.3594	0.052047	0.460292

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

COWYILD - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	8.43532	8.41269	-0.02263	-0.067923
RMS	8.63095	8.59282	0.13062	1.42141



TIME BOUNDS: 1953 TO 1979

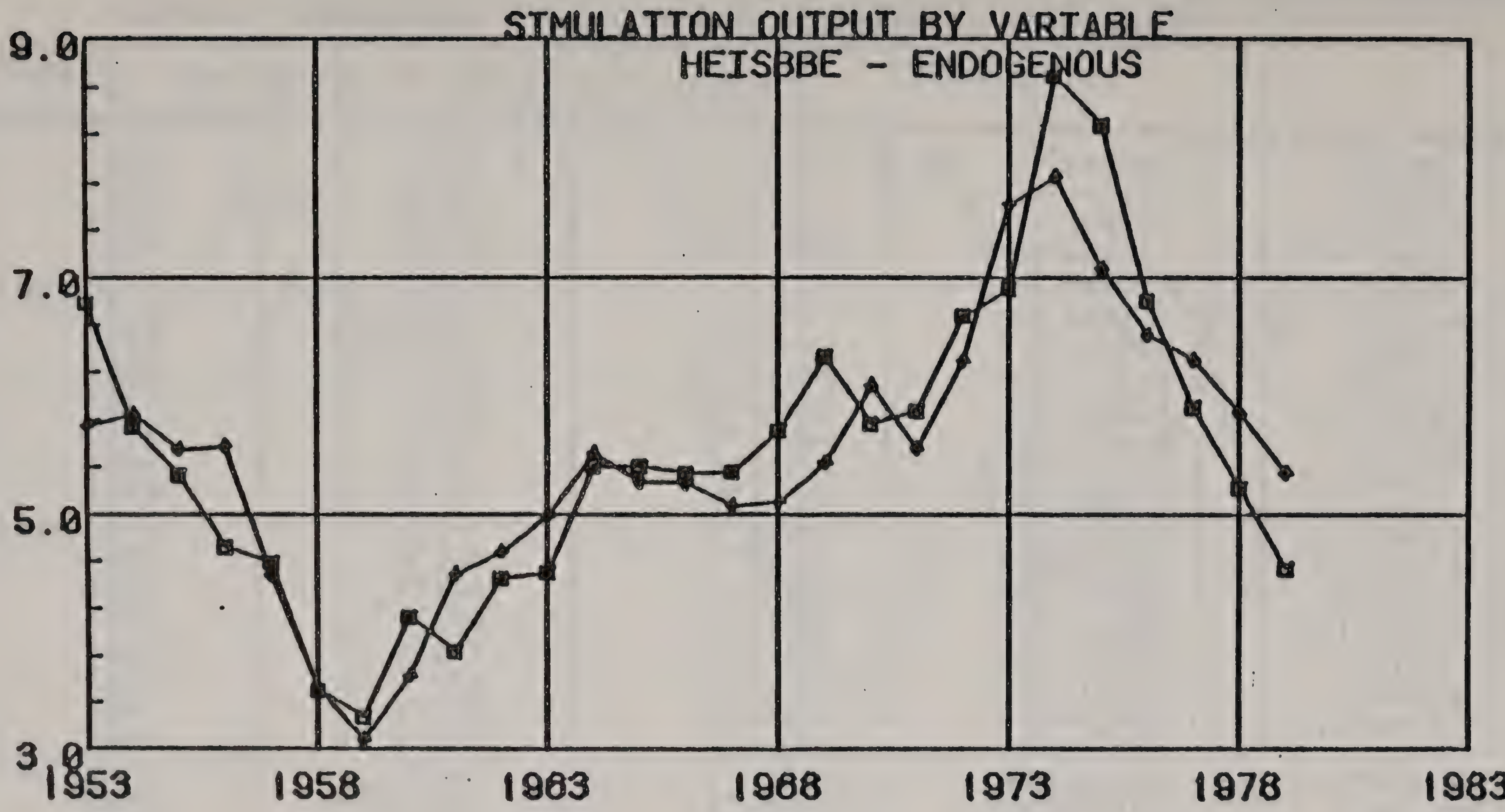
SYMBOL	SCALE	NAME
□	#1	ACTUAL
◆	#1	SIMULATE

MAFCAV = ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	50.211	51.047	0.835953	1.66488
1954	49.634	51.2142	1.58017	3.18364
1955	50.352	50.9464	0.59436	1.18041
1956	50.44	51.5116	1.07164	2.12458
1957	48.745	50.8914	2.14638	4.40328
1958	48.386	52.9013	4.5153	9.33184
1959	50.642	56.5559	5.91391	11.6779
1960	52.911	59.5296	6.61862	12.509
1961	53.489	61.1828	7.69382	14.3839
1962	54.916	61.8599	6.94389	12.6446
1963	57.337	64.2315	6.8945	12.0245
1964	58.875	66.255	7.38005	12.5351
1965	60.22	65.9957	5.77567	9.59094
1966	60.872	67.3133	6.44128	10.5817
1967	61.288	68.6132	7.3252	11.9521
1968	61.686	70.4243	8.7383	14.1658
1969	61.975	72.3204	10.3454	16.6929
1970	63.589	74.2019	10.6129	16.6898
1971	64.791	74.3782	9.58719	14.7971
1972	67.276	77.9251	10.6491	15.829
1973	68.985	79.2041	10.2191	14.8135
1974	73.309	81.0095	7.7005	10.5042
1975	75.096	80.3181	5.22215	6.95397
1976	73.005	77.2653	4.26033	5.83567
1977	70.386	73.9123	3.52631	5.00995
1978	66.627	69.5108	2.88383	4.32833
1979	63.022	66.0551	3.03314	4.81283

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	59.9282	65.7989	5.8707	9.63781
RMS	60.475	66.5284	6.62997	10.7841
STD.DEV	8.26805	10.0121	3.1395	4.93045



TIME BOUNDS: 1953 TO 1979

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

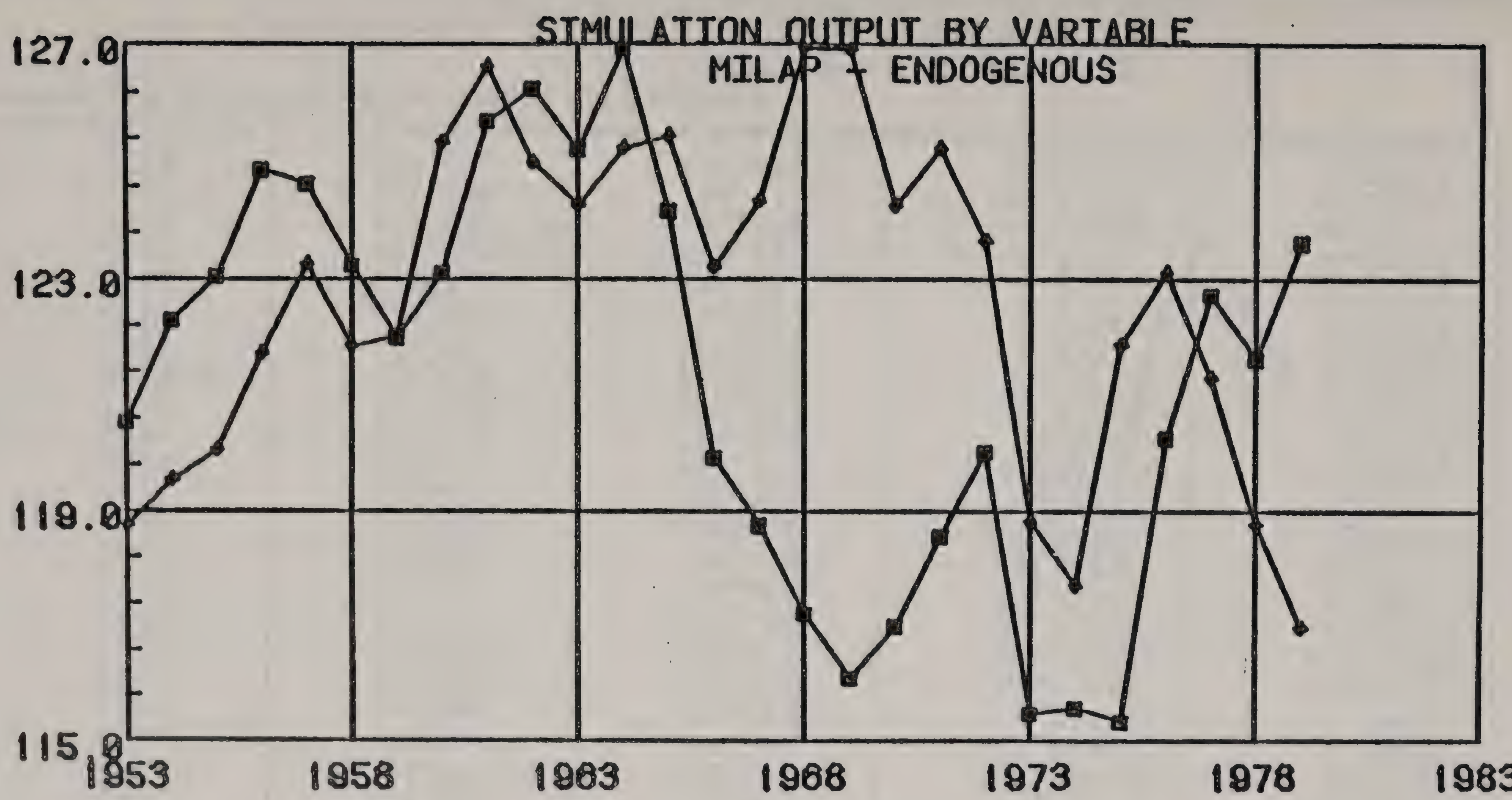
HEISBBE - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	6.78	5.74301	-1.03699	-15.2949
1954	5.74	5.8376	0.0976	1.70035
1955	5.32	5.54237	0.222368	4.17985
1956	4.716	5.56325	0.847252	17.9655
1957	4.587	4.47724	-0.109759	-2.39283
1958	3.507	3.53007	0.023067	0.657755
1959	3.281	3.08396	-0.197044	-6.00562
1960	4.124	3.62205	-0.501951	-12.1715
1961	3.838	4.48533	0.64733	16.8663
1962	4.457	4.66819	0.211194	4.73848
1963	4.511	4.98191	0.470907	10.4391
1964	5.409	5.51455	0.105548	1.95134
1965	5.397	5.27073	-0.126275	-2.33973
1966	5.337	5.25646	-0.080544	-1.50915
1967	5.351	5.07052	-0.280479	-5.24163
1968	5.71	5.10476	-0.605239	-10.5996
1969	6.32	5.43574	-0.884261	-13.9915
1970	5.768	6.08498	0.316985	5.49558
1971	5.864	5.56056	-0.303438	-5.17459
1972	6.675	6.28868	-0.386315	-5.78749
1973	6.901	7.60815	0.707146	10.247
1974	8.692	7.83641	-0.855593	-9.84344
1975	8.276	7.06755	-1.20845	-14.6019
1976	6.793	6.50462	-0.288377	-4.2452
1977	5.904	6.29249	0.388492	6.58014
1978	5.221	5.86174	0.640737	12.2723
1979	4.538	5.34425	0.806252	17.7667

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

HEISBBE - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	5.51914	5.46804	-0.051105	0.06153



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

SYMBOL	SCALE	NAME
◻	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

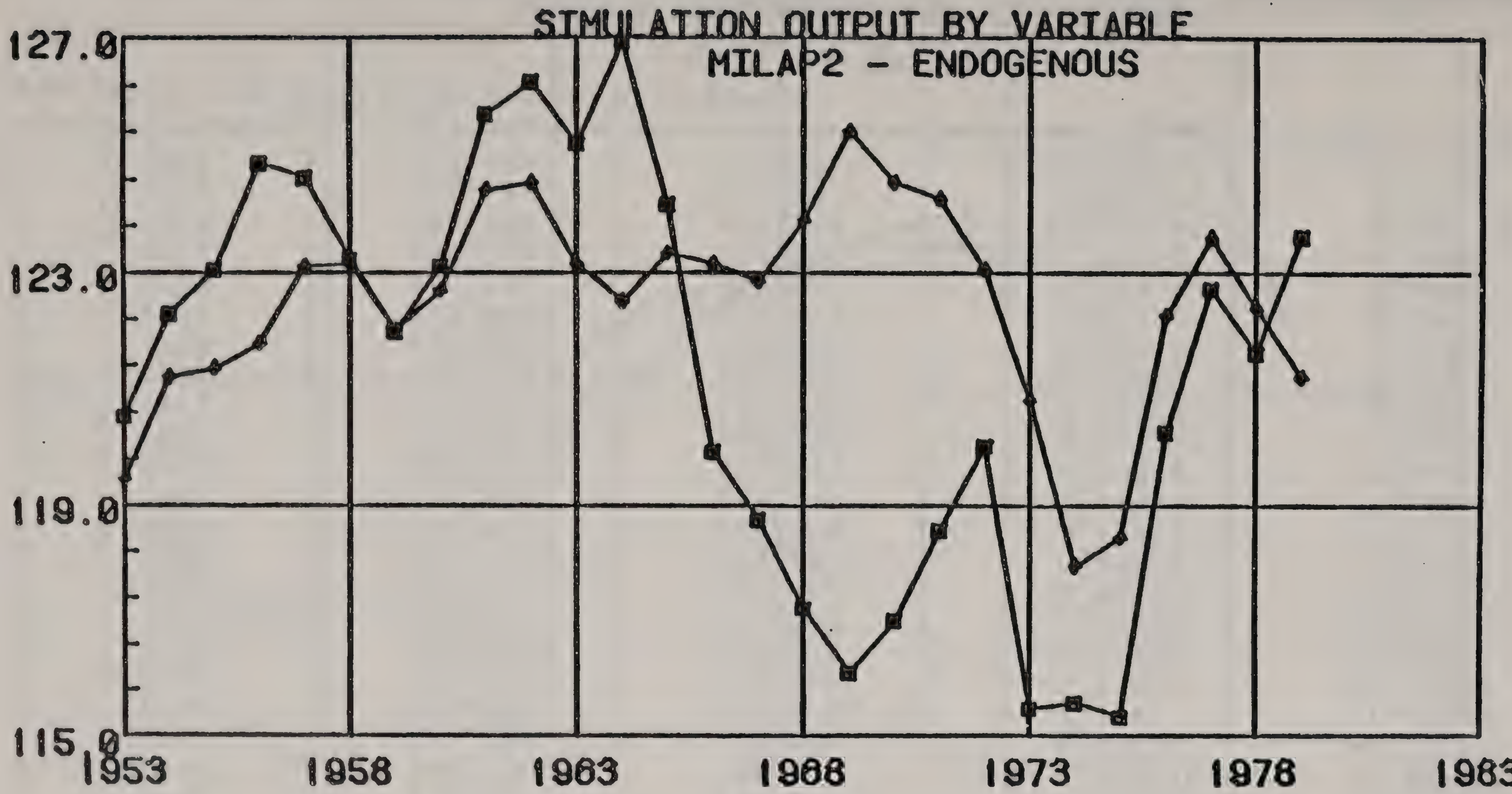
MILAP - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	120.521	118.734	-1.78748	-1.48312
1954	122.294	119.521	-2.77327	-2.26771
1955	123.045	120.034	-3.01056	-2.44671
1956	124.86	121.698	-3.16243	-2.53278
1957	124.628	123.261	-1.36679	-1.0967
1958	123.22	121.841	-1.37938	-1.11944
1959	121.989	122.015	0.026199	0.021477
1960	123.109	125.335	2.22644	1.80851
1961	125.707	126.643	0.935699	0.744349
1962	126.251	124.985	-1.26578	-1.00259
1963	125.202	124.243	-0.959152	-0.766084
1964	126.967	125.239	-1.72771	-1.36075
1965	124.18	125.434	1.25385	1.0097
1966	119.912	123.189	3.27748	2.73324
1967	118.732	124.312	5.58043	4.70002
1968	117.225	126.926	9.70143	8.2759
1969	116.108	126.939	10.8313	9.32868
1970	117.007	124.268	7.2606	6.20527
1971	118.566	125.241	6.67465	5.62948
1972	120.025	123.637	3.61185	3.00924
1973	115.491	118.808	3.3172	2.87226
1974	115.586	117.701	2.11487	1.82969
1975	115.334	121.875	6.54102	5.67137
1976	120.269	123.113	2.8439	2.36462
1977	122.698	121.298	-1.39961	-1.1407
1978	121.609	118.771	-2.83772	-2.33348
1979	123.623	116.971	-6.65237	-5.38118

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

MILAP - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	121.265	122.668	1.40277	1.23231
RMS	121.315	122.701	4.4342	3.75091



TIME BOUNDS: 1953 TO 1979

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◊	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

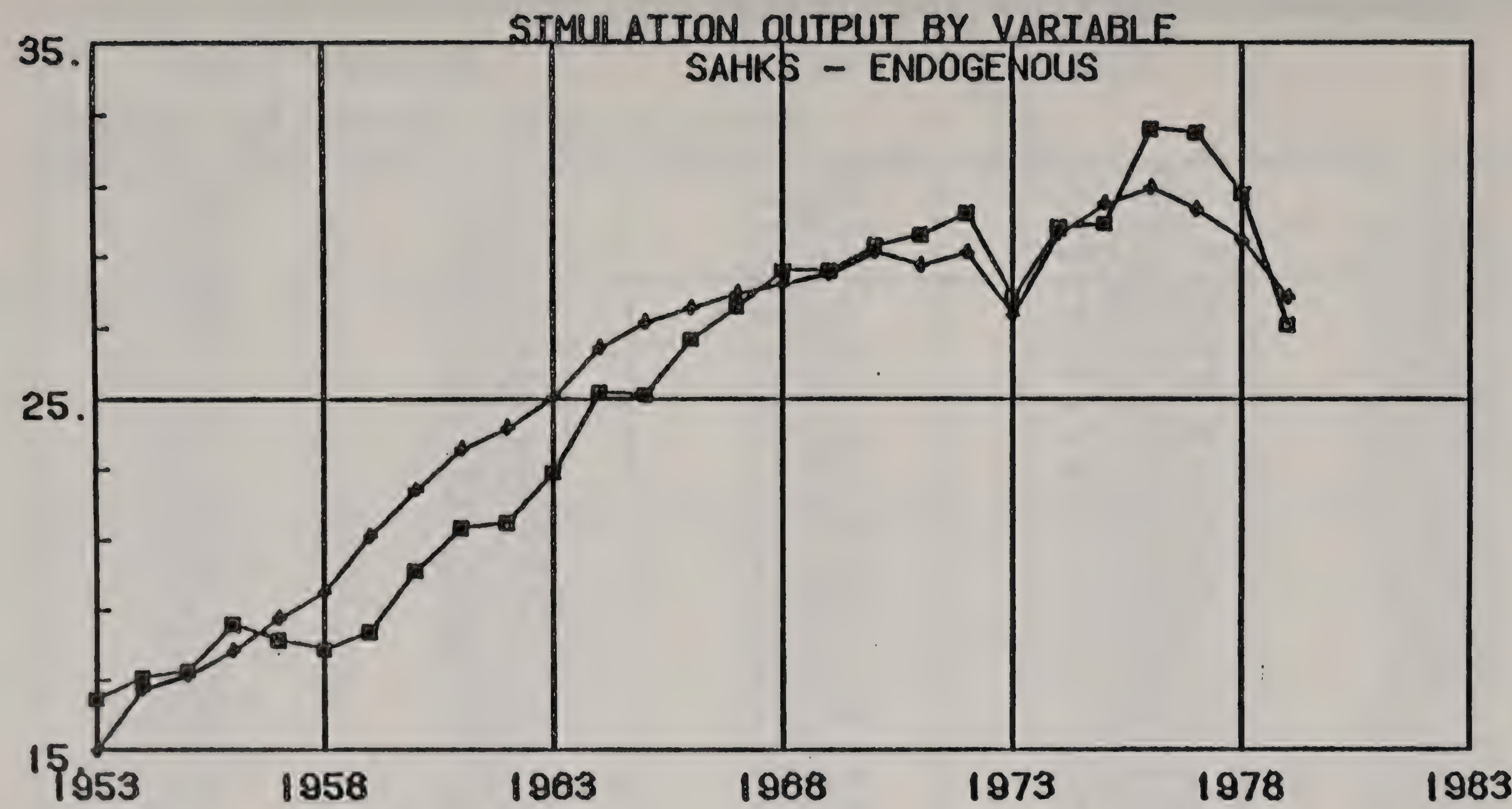
MILAP2 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	120.521	119.439	-1.08153	-0.897377
1954	122.294	121.192	-1.10172	-0.900874
1955	123.045	121.353	-1.69171	-1.37487
1956	124.86	121.774	-3.08592	-2.47151
1957	124.628	123.113	-1.51503	-1.21564
1958	123.22	123.149	-0.070923	-0.057558
1959	121.989	122.01	0.020782	0.017036
1960	123.109	122.674	-0.435242	-0.353542
1961	125.707	124.405	-1.3024	-1.03606
1962	126.251	124.518	-1.73285	-1.37254
1963	125.202	123.138	-2.06369	-1.64829
1964	126.967	122.493	-4.47414	-3.52386
1965	124.18	123.317	-0.862747	-0.694755
1966	119.912	123.148	3.23628	2.69888
1967	118.732	122.845	4.11333	3.46438
1968	117.225	123.891	6.66589	5.68641
1969	116.108	125.413	9.30522	8.01428
1970	117.007	124.527	7.51985	6.42684
1971	118.566	124.265	5.69888	4.80651
1972	120.025	123.055	3.03012	2.52457
1973	115.491	120.813	5.32162	4.60783
1974	115.586	117.943	2.35684	2.03904
1975	115.334	118.447	3.11334	2.69941
1976	120.269	122.267	1.99762	1.66096
1977	122.698	123.582	0.883667	0.720197
1978	121.609	122.39	0.781006	0.642227
1979	123.623	121.191	-2.43175	-1.96707

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

MILAP2 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	121.265	122.457	1.1924	1.05535
RMS	121.315	122.47	3.64367	3.08318



TIME BOUNDS: 1953 TO 1979

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

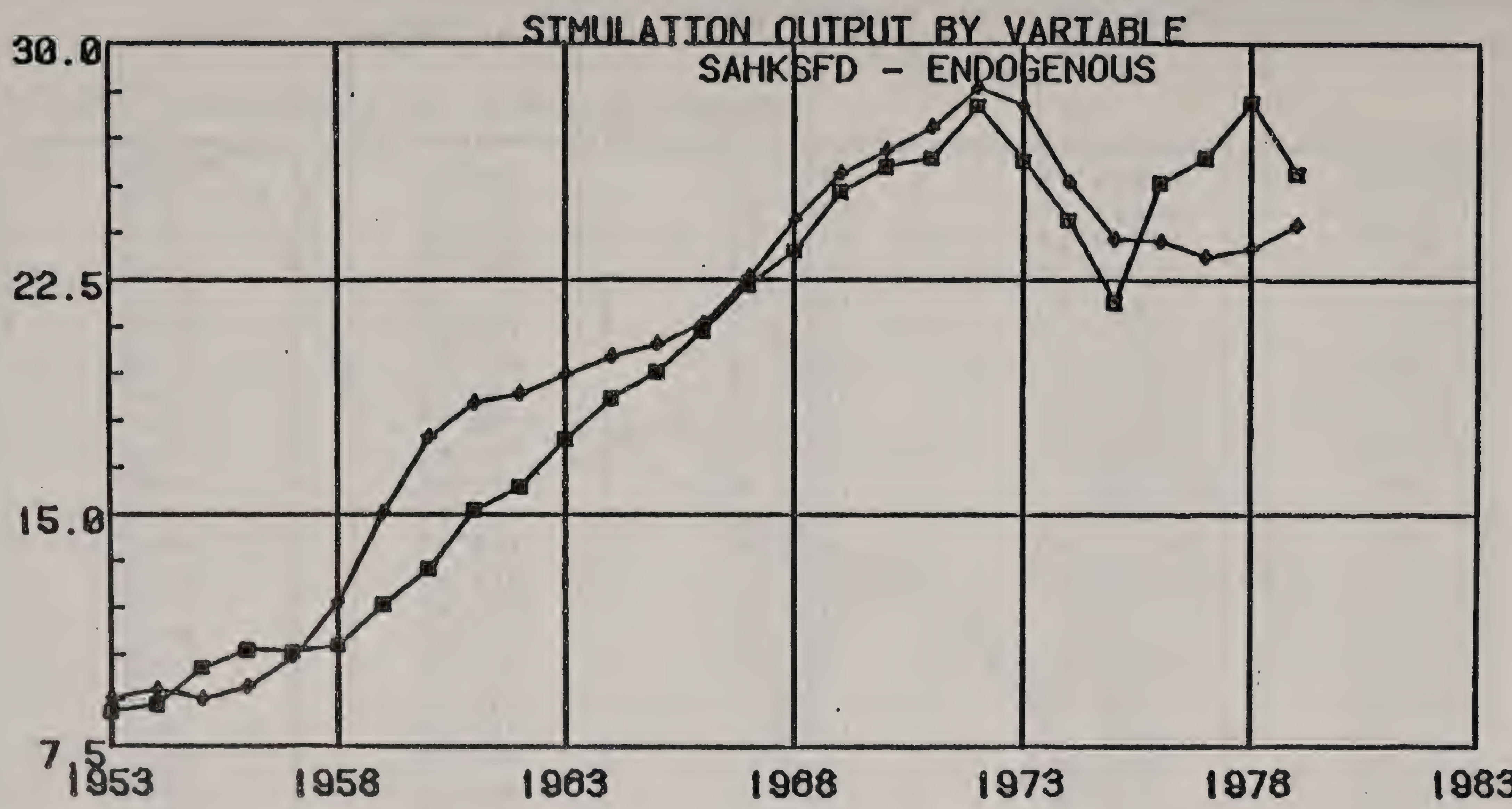
SAHKS - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	16.465	15.0391	-1.42586	-8.65996
1954	17.089	16.731	-0.357971	-2.09475
1955	17.312	17.1667	-0.145264	-0.839092
1956	18.601	17.8415	-0.759476	-4.08298
1957	18.138	18.7524	0.61438	3.38725
1958	17.893	19.5109	1.61786	9.04185
1959	18.422	21.1099	2.68788	14.5906
1960	20.125	22.4062	2.28122	11.3352
1961	21.343	23.5499	2.20692	10.3403
1962	21.509	24.1834	2.67442	12.434
1963	22.893	25.0265	2.13351	9.3195
1964	25.201	26.4237	1.22272	4.85186
1965	25.143	27.1579	2.01494	8.01391
1966	26.686	27.5261	0.840134	3.14822
1967	27.615	27.9473	0.332245	1.20313
1968	28.627	28.1954	-0.431641	-1.50781
1969	28.622	28.486	-0.136002	-0.475164
1970	29.305	29.0947	-0.210266	-0.717509
1971	29.596	28.7796	-0.816422	-2.75855
1972	30.206	29.1373	-1.06871	-3.53807
1973	27.854	27.3691	-0.484909	-1.74089
1974	29.839	29.6393	-0.199707	-0.669282
1975	29.907	30.4726	0.565613	1.89124
1976	32.58	30.9135	-1.66655	-5.11525
1977	32.517	30.308	-2.209	-6.79337
1978	30.778	29.4734	-1.30457	-4.23863
1979	27.119	27.8613	0.74231	2.73723

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

SAHKS - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	24.866	25.1889	0.322882	1.81714
RMS	25.4111	25.6362	1.41017	6.40263
STD DEV	[illegible]	[illegible]	[illegible]	[illegible]



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

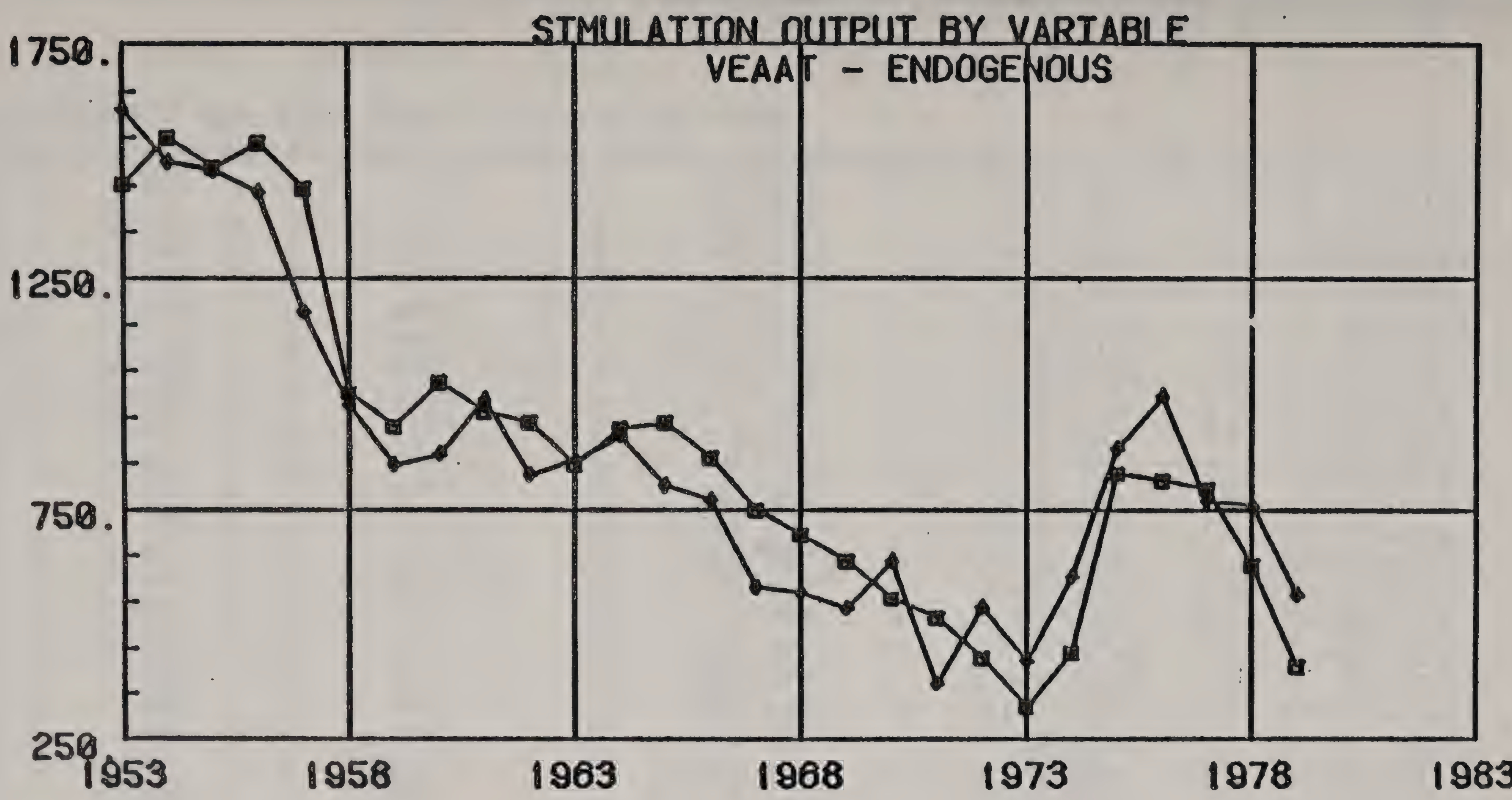
SAHKSFD - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	8.648	9.13617	0.488171	5.6449
1954	8.893	9.33105	0.438052	4.92581
1955	10.071	9.07327	-0.997729	-9.90695
1956	10.642	9.43468	-1.20732	-11.3449
1957	10.623	10.4407	-0.182259	-1.7157
1958	10.844	12.1887	1.34472	12.4006
1959	12.125	15.009	2.88405	23.7859
1960	13.246	17.4986	4.25261	32.1049
1961	15.116	18.5643	3.44829	22.8121
1962	15.906	18.8463	2.94027	18.4853
1963	17.434	19.4848	2.05084	11.7635
1964	18.72	20.0224	1.3024	6.95726
1965	19.601	20.4517	0.850677	4.33997
1966	20.879	21.1216	0.242569	1.16178
1967	22.331	22.5708	0.239761	1.07367
1968	23.415	24.3819	0.966934	4.12955
1969	25.301	25.8677	0.566666	2.2397
1970	26.104	26.6414	0.537354	2.05851
1971	26.38	27.3746	0.994553	3.7701
1972	28.025	28.5842	0.559219	1.99543
1973	26.305	28.0426	1.73758	6.60551
1974	24.421	25.5996	1.17863	4.82631
1975	21.763	23.7661	2.00308	9.20407
1976	25.585	23.7295	-1.85547	-7.25217
1977	26.415	23.2119	-3.20309	-12.126
1978	28.158	23.4847	-4.67329	-16.5967
1979	25.857	24.2343	-1.62268	-6.27559

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

SAHKSFD - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	19.3632	19.9293	0.566095	4.26173
RMS	[illegible]	[illegible]	1.99859	11.89



TIME BOUNDS: 1953 TO 1979

SYMBOL	SCALE	NAME
◻	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

VEAAT - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1953	1451.	1612.69	161.692	11.1435
1954	1551.	1499.39	-51.6055	-3.32724
1955	1487.	1477.7	-9.30469	-0.625736
1956	1541.	1432.22	-108.777	-7.05888
1957	1442.	1175.19	-266.807	-18.5026
1958	1003.	974.324	-28.6755	-2.85898
1959	929.	846.791	-82.209	-8.84918
1960	1025.	868.849	-156.151	-15.2343
1961	960.	985.319	25.3188	2.63738
1962	936.	823.834	-112.166	-11.9835
1963	847.	857.263	10.2627	1.21165
1964	928.	907.935	-20.0652	-2.1622
1965	936.	799.562	-136.438	-14.5768
1966	862.	772.406	-89.5945	-10.3938
1967	749.	580.124	-168.876	-22.5468
1968	696.	571.526	-124.474	-17.8842
1969	640.	534.134	-105.866	-16.5415
1970	558.	640.139	82.1394	14.7203
1971	516.	372.046	-143.954	-27.898
1972	429.	537.902	108.902	25.3851
1973	325.	424.099	99.0989	30.492
1974	442.	605.717	163.717	37.0401
1975	827.	881.075	54.0754	6.53874
1976	813.	994.655	181.655	22.3437
1977	794.	767.629	-26.3706	-3.32123
1978	632.	758.818	126.818	20.0661
1979	410.	565.766	155.766	37.9918

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

VEAAT - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	878.852	861.743	-17.107	0.955764
RMS	945.785	921.237	120.552	18.0181
STD_DEV	356.13	331.899	121.605	18.3354

II.2 The U.S. Pork Supply Submodel

The structure of the pork model is similar to the beef model, but simpler since the production lags are shorter and the range of products less varied. Basically, there are two sources of pork production: 1) From the commercial herds and 2) from the breeding herds. The commercial herds are mostly a result of hybrids of pure breds raised in breeding farms.

At the breeding herd level, investments and disinvestments decisions concern the further breeding of sows or their slaughter. The basic identity relating animals stocks and flows in the breeding herd is:

$$ST_t^B = ST_{t-1}^B - SL_t^B + AD_t^B$$

where:

ST_t^B = stock of breeding herd at the end of year t,

SL_t^B = slaughter of sows during year t,

AD_t^B = additions to the breeding herd in year t.

On the other hand, in the commercial herds, the basic identity relating animal stocks and flows is:

$$ST_t^C = ST_{t-1}^C + NB_t - SL_t^C - AD_t^B$$

where:

ST_t^C = stock of commercial herd at the end of year t,

NB_t = newly born pigs during year t,

SL_t^C = barrow and gilts slaughtered during year t.

As in the case of beef and dairy, the specification of the slaughter and the additions to the breeding herd equations depend on the beginning levels of the pertinent stocks of animals and on the ratios of product to input prices. But, unlike the case in beef, the function explaining the number of newly born pigs depends not only on the number of hogs in the breeding herd but also on the profitability of raising pigs as

represented by the ratio of product to input prices. This is probably due to shorter gestation period and to the possibility to control the number of sows that are actually bred.

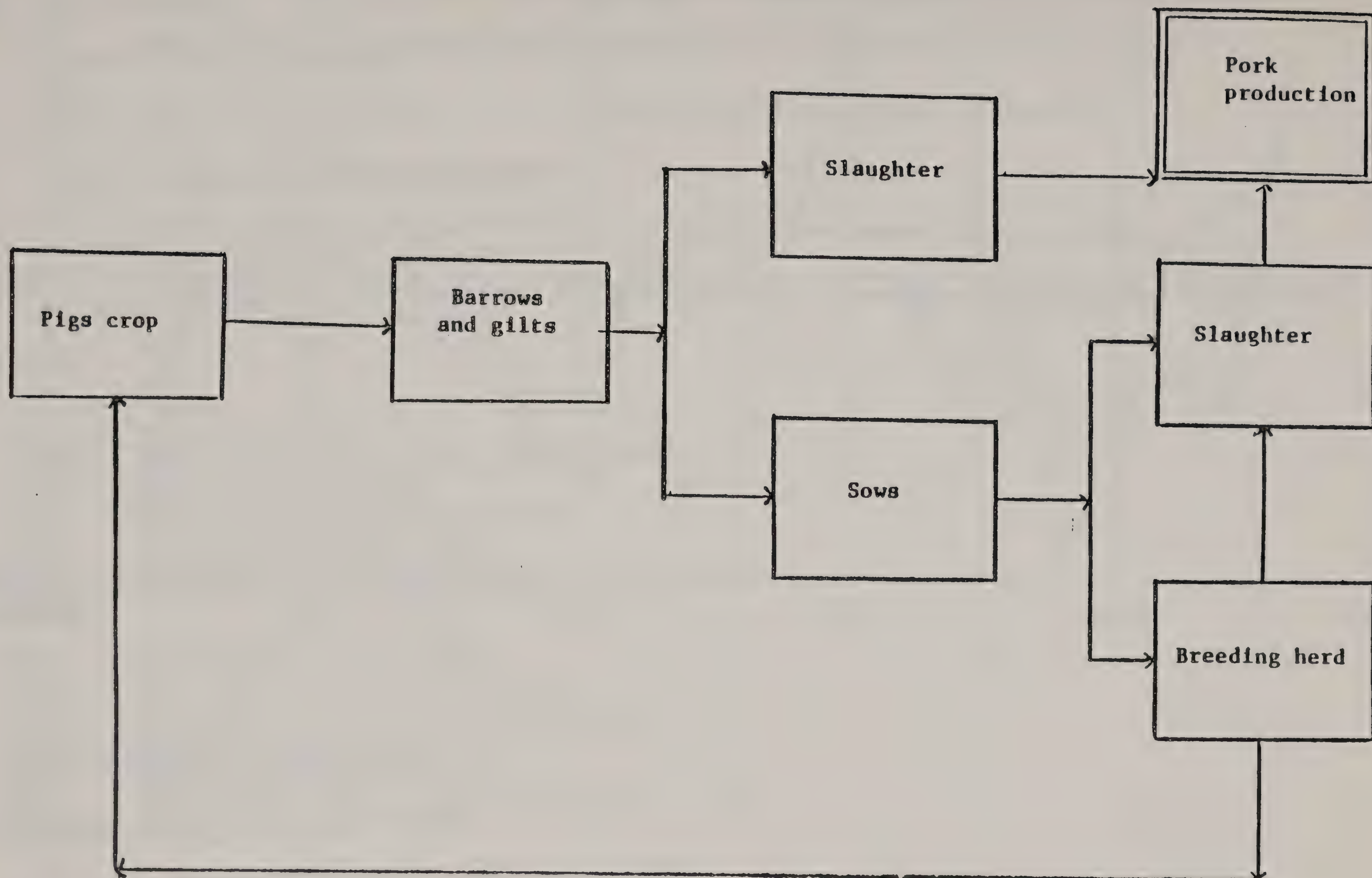
Similar to our results in the beef and dairy model an increase in the moving average of the price of pork relative to the price of corn will result in more pigs being added to the breeding herd and less sows, barrows and gilts being slaughtered. This implies that the breeding herd is regarded as capital and additions and subtractions from it, as investments and disinvestments.

Once slaughter is determined, pork production is obtained allowing relative prices to affect weight.

Finally, an ending stock of pork equation was estimated showing the effects of availability supplies and of price changes.

The relation between herd equation and end products in the pork model is illustrated in the following flow chart diagram. Next, the pork model is presented and its historical simultaneous validation shown. The data and the statistical characteristics of the estimated equations are presented in the Appendix to this section.

The U.S. Pork Model



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MODEL: PORK

SYMBOL DECLARATIONS

ENDOGENOUS:
   BAGKS     - BARROWS AND GILTS SLAUGHTERED, MIL HEAD
   HOGSM     - HOGS, MARKET, NUMBER ON FARMS, US, MIL HEAD
   HOGSNBR   - HOGS, BREEDING, NUMBER ON FARMS, DEC 1, US, MIL HEAD
   PIGSC     - PIGS, CROP, US, MIL HEAD
   PIGSEBR   - PIGS ADDED TO BREEDING HERD, MIL HEAD
   PORAP77   - PORK, PRODUCTION, CARCASS WT., US, MIL LBS
   PORAS77   - PORK, SUPPLY, CARCASS WT., US, MIL LBS
   PORHTI    - PORK, ENDING STOCKS, US, MIL LBS
   SOWKS     - SOWS, SLAUGHTER, US, MIL HEAD

EXOGENOUS:
   BAGPM7C   - BARROWS AND GILTS, PRICE, SEVEN MARKETS, $/CWT
   CORPF     - CORN, AVE PRICE RECEIVED BY FARMERS, OCT-SEP US, $/BU
   DUM73     - DUMMY VARIABLE, 1973=1, OTHER=0
   DUM74     - DUMMY VARIABLE, 1974=1, OTHER=0
   FARWAG    - ANNUAL AVERAGE HOURLY WAGE RATE, $/HR
   PIGDD     - PIGS: DEATH LOSS PERCENT
   PORMI77   - PORK, IMPORTS, CARCASS WT., US, MIL LBS
   PTDUMPIG  - DUMMY FOR DATA REDEFINITION OF BREEDING HOGS,
               =1, 1950-1963

EQUATIONS

    SLAUGHTER OF SOWS:
 1:         SOWKS = 2.49713+0.80166*HOGSNBR(-1)+1.12566*PTDUMPIG-0.10119*(BAGPM7C/CORPF+BAGPM7C(-1)/CORPF(-1))

    PIGS ADDED TO BREEDING HERD:
 2:         PIGSEBR = 0.37157-0.33556*HOGSNBR(-1)-0.7114*DUM74+1.10004*SOWKS+0.1172*BAGPM7C/CORPF

    NUMBER OF BREEDING HOGS ON FARMS, DEC 1:
 3:         HOGSNBR = HOGSNBR(-1)-SOWKS+PIGSEBR

    NUMBER OF NEWLY BORN PIGS:
 4:         PIGSC = 12.6958+5.76795*HOGSNBR(-1)+5.0634*PTDUMPIG+1.49979*BAGPM7C(-1)/CORPF(-1)

    BARROWS AND GILTS SLAUGHTERED:
 5:         BAGKS = 20.8191+0.62966*HOGSM(-1)-1.59566*DUM73-0.56112*BAGPM7C/FARWAG+0.37348*PIGSC

    PORK PRODUCTION:
 6:         PORAP77 = -1150.07+142.74*(1.5*SOWKS+BAGKS)+80.6811*BAGPM7C(-1)/CORPF(-1)+0.10338*PORAP77(-1)

    ENDING STOCKS OF PORK:
 7:         PORHTI = -593.767+11.5173*HOGSM+0.51596*PORHTI(-1)+4.46022*(BAGPM7C/FARWAG+BAGPM7C(-1)/FARWAG(-1))

    NUMBER OF MARKETABLE HOGS ON FARM:
 8:         HOGSM = HOGSM(-1)*(1.-PIGDD)+PIGSC*(1.-PIGDD)-BAGKS-PIGSEBR
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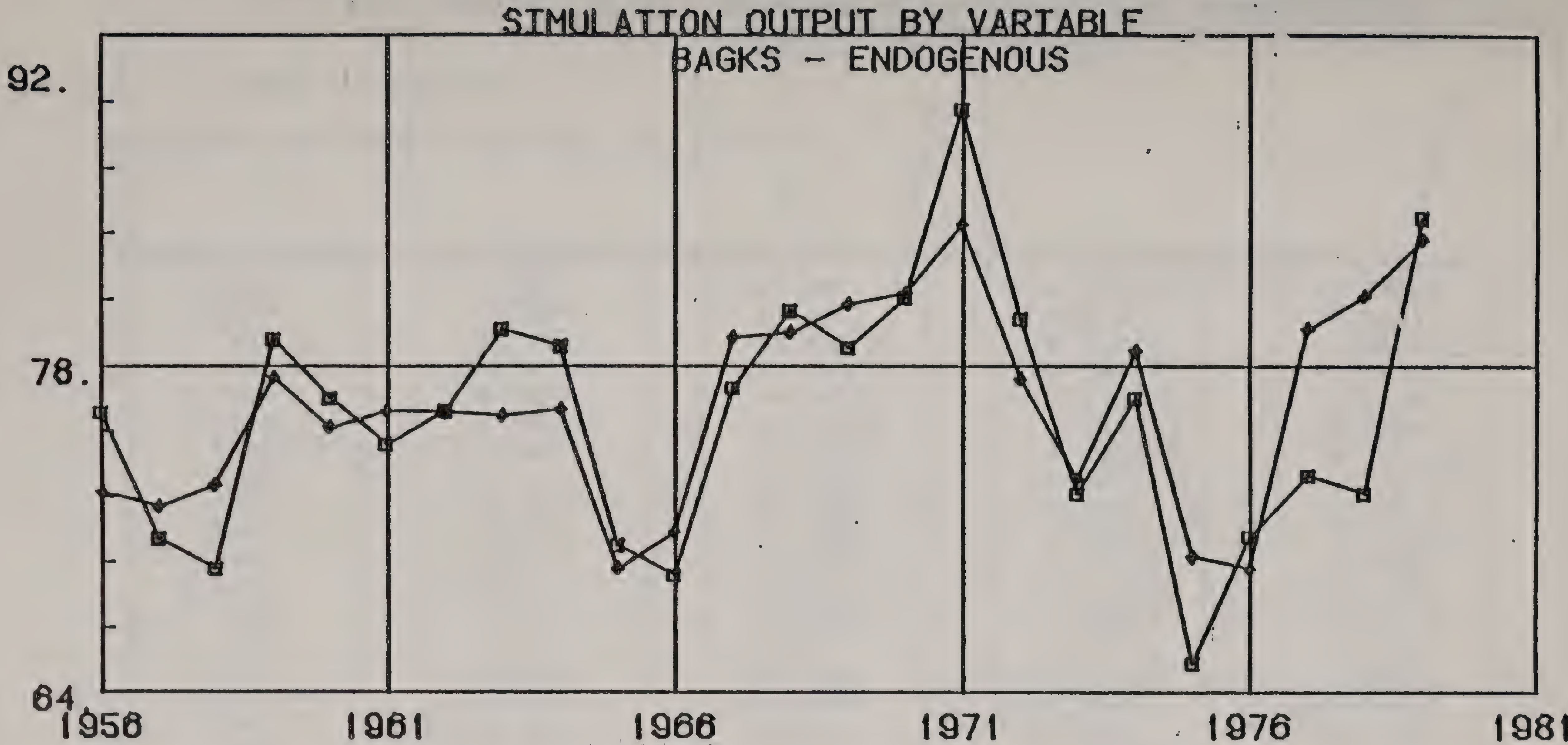


TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◊	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

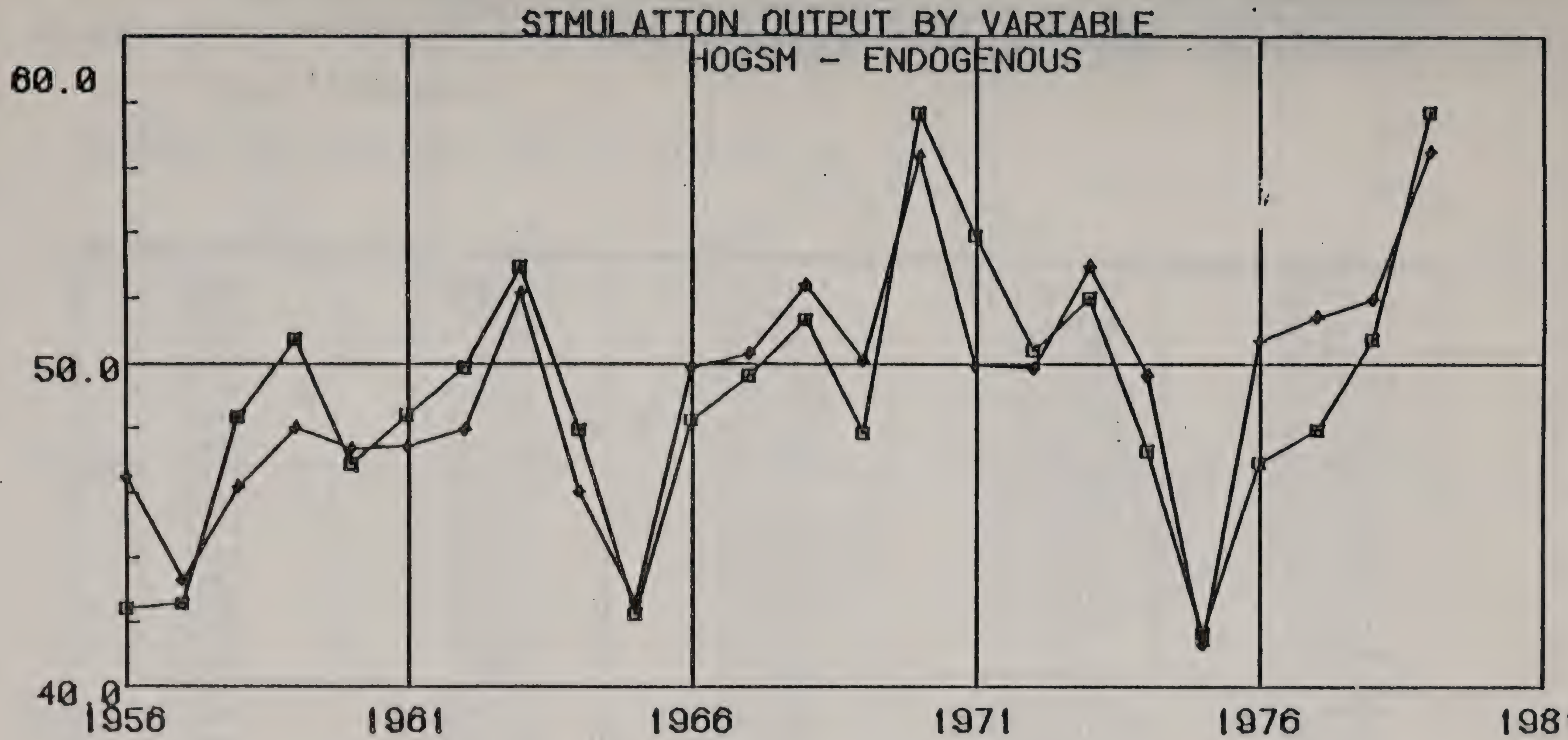
BAGKS - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1956	75.962	72.6057	-3.35634	-4.41844
1957	70.615	71.9237	1.30873	1.85333
1958	69.37	72.9023	3.53235	5.09204
1959	79.108	77.4896	-1.61838	-2.04578
1960	76.64	75.3167	-1.32335	-1.72671
1961	74.656	76.0897	1.43367	1.92037
1962	76.058	75.9998	-0.058212	-0.076537
1963	79.507	75.8677	-3.6393	-4.57733
1964	78.837	76.1164	-2.72061	-3.45093
1965	70.345	69.3188	-1.02618	-1.45879
1966	69.057	70.923	1.86598	2.70209
1967	77.054	79.1846	2.13063	2.76511
1968	80.322	79.3943	-0.927658	-1.15492
1969	78.723	80.5775	1.85445	2.35566
1970	80.834	81.0545	0.220505	0.272787
1971	88.887	83.9519	-4.93512	-5.55213
1972	79.975	77.3861	-2.58894	-3.23719
1973	72.552	73.1843	0.632309	0.871525
1974	76.604	78.6307	2.02666	2.64563
1975	65.285	69.8622	4.57715	7.01102
1976	70.7	69.309	-1.39101	-1.96748
1977	73.265	79.496	6.23099	8.50472
1978	72.522	80.9003	8.37827	11.5527
1979	84.227	83.3413	-0.885742	-1.05161

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

BAGKS - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	75.8793	76.2843	0.405035	0.701214
RMS	76.0602	76.4015	3.12389	4.21125
STD_DEV	[illegible]	[illegible]	[illegible]	[illegible]



TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

SYMBOL	SCALE	NAME
¤	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

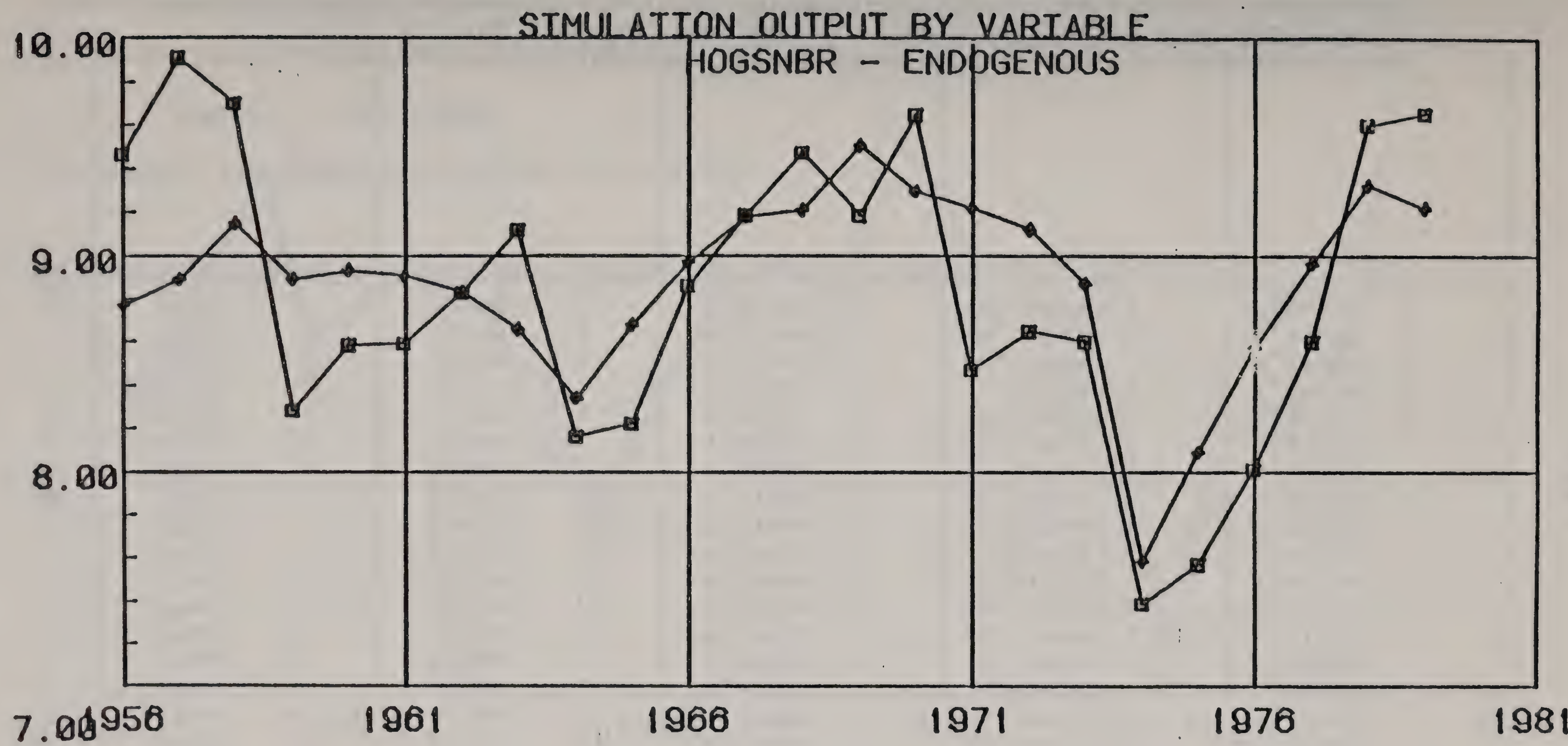
HUGSM - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1956	42.433	46.4705	4.03749	9.51498
1957	42.604	43.3134	0.709381	1.66506
1958	48.344	46.1839	-2.16006	-4.46811
1959	50.742	48.0028	-2.73917	-5.39822
1960	46.917	47.3459	0.428879	0.914122
1961	48.402	47.446	-0.955994	-1.97511
1962	49.866	47.9395	-1.92651	-3.86338
1963	52.943	52.1629	-0.780136	-1.47354
1964	47.94	46.039	-1.90099	-3.96534
1965	42.295	42.6557	0.360718	0.852861
1966	48.263	49.873	1.61	3.33589
1967	49.632	50.2579	0.625931	1.26114
1968	51.357	52.3919	1.03488	2.01507
1969	47.857	50.0512	2.19421	4.58494
1970	57.64	56.3136	-1.32639	-2.30115
1971	53.937	49.9403	-3.99667	-7.40989
1972	50.367	49.8244	-0.542557	-1.07721
1973	52.009	52.9767	0.967712	1.86066
1974	47.304	49.6422	2.33815	4.94282
1975	41.693	41.3222	-0.370834	-0.88944
1976	46.923	50.6853	3.76233	8.01809
1977	47.936	51.3907	3.4547	7.20689
1978	50.751	51.9474	1.19641	2.35741
1979	57.699	56.4751	-1.22395	-2.12127

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

HUGSM - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	48.9938	49.1937	0.199897	0.566136
RMS	49.1691	49.3335	2.04727	4.25651
STD_DEV	4.23636	3.7899	2.08131	4.30943



TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

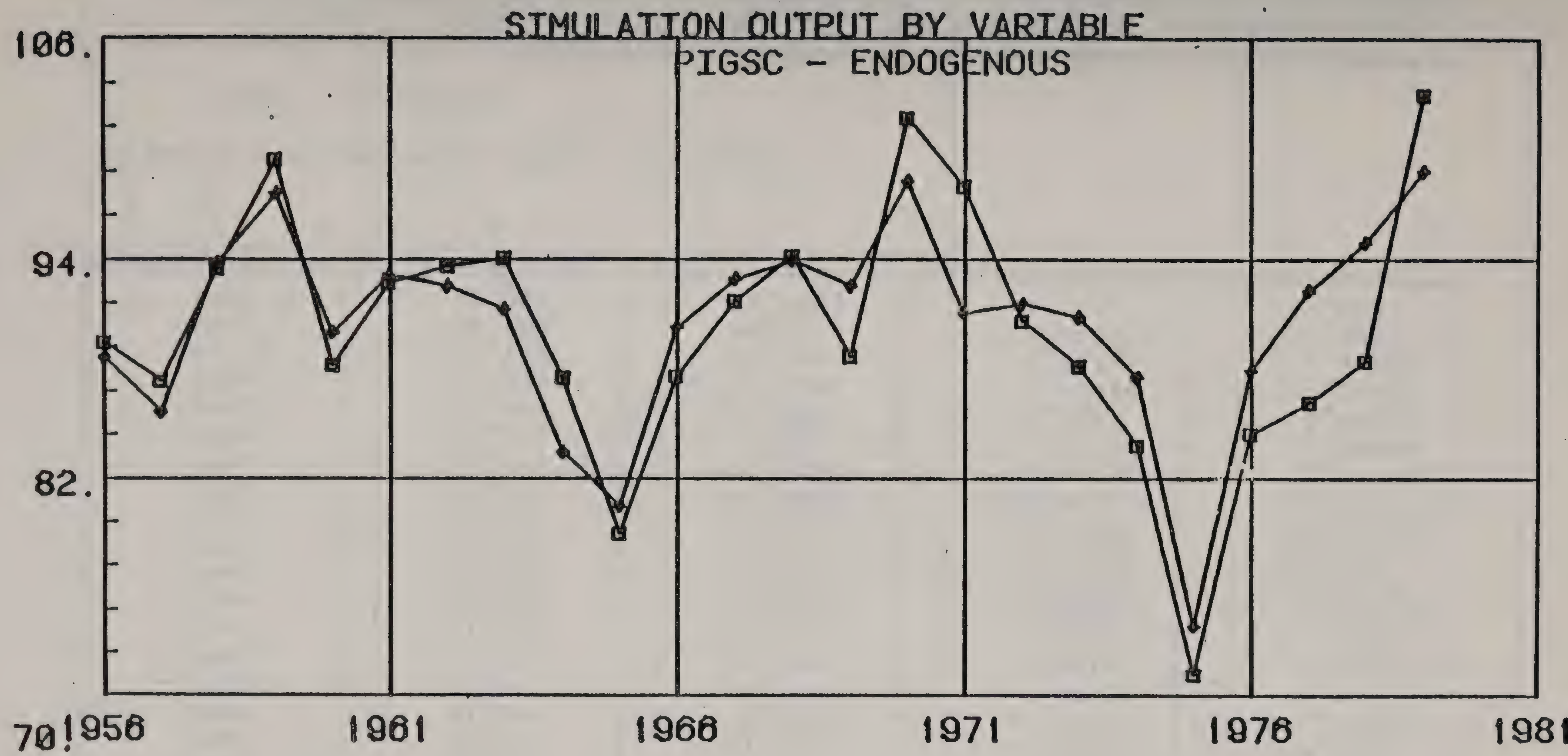
HUGBNBR - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1956	9.464	8.76966	-0.694339	-7.33663
1957	9.913	8.89038	-1.02262	-10.3159
1958	9.701	9.14513	-0.555872	-5.73005
1959	8.284	8.88763	0.603634	7.28674
1960	8.589	8.92526	0.336259	3.91499
1961	8.598	8.90717	0.309167	3.5958
1962	8.829	8.83136	0.002358	0.026712
1963	9.117	8.65486	-0.462142	-5.06901
1964	8.166	8.33837	0.172365	2.11077
1965	8.224	8.67477	0.450772	5.48118
1966	8.862	8.96594	0.103944	1.17292
1967	9.186	9.17542	-0.010583	-0.115207
1968	9.472	9.20774	-0.264265	-2.78996
1969	9.189	9.50704	0.318035	3.46104
1970	9.645	9.28937	-0.35563	-3.68719
1971	8.475	9.21487	0.739865	8.72997
1972	8.65	9.11667	0.46667	5.39503
1973	8.605	8.86611	0.261115	3.03446
1974	7.389	7.58399	0.19499	2.63892
1975	7.574	8.0864	0.512397	6.7652
1976	8.011	8.5751	0.564096	7.04152
1977	8.604	8.95988	0.355882	4.13624
1978	9.605	9.32296	-0.282039	-2.93637
1979	9.655	9.21427	-0.440725	-4.56474

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

HUGBNBR - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	8.82528	8.87959	0.054306	0.926933
RMS	8.85082	8.88926	0.457224	5.13476
STD.DEV	0.686283	0.423334	0.463752	5.15903



TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

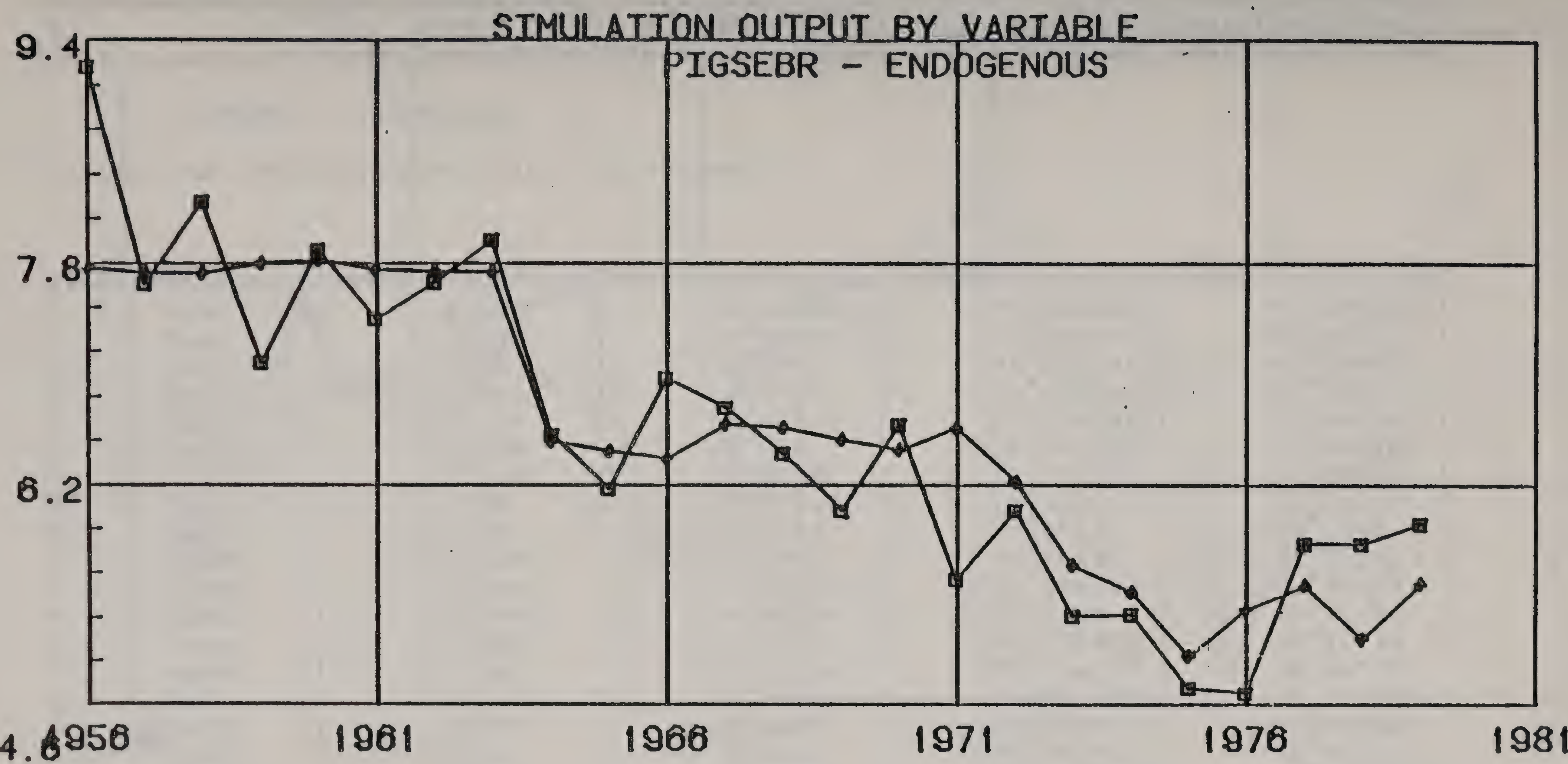
PIGSC - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1956	89.426	88.6053	-0.820709	-0.917752
1957	87.362	85.5723	-1.78972	-2.04862
1958	93.533	93.7512	0.218216	0.233304
1959	99.395	97.6246	-1.77045	-1.78122
1960	88.216	89.934	1.71796	1.94744
1961	92.713	93.1763	0.463272	0.499684
1962	93.608	92.532	-1.07602	-1.14949
1963	94.056	91.2216	-2.83435	-3.01347
1964	87.544	83.3974	-4.14658	-4.73656
1965	78.941	80.4165	1.47551	1.86913
1966	87.603	90.2707	2.66768	3.04519
1967	91.668	92.8223	1.15425	1.25916
1968	94.155	93.8239	-0.3311	-0.351655
1969	88.676	92.4546	3.77858	4.26111
1970	101.714	98.1871	-3.52693	-3.4675
1971	97.924	91.0285	-6.89545	-7.04163
1972	90.574	91.4681	0.894058	0.987102
1973	88.123	90.7576	2.63458	2.98966
1974	83.744	87.52	3.77599	4.50896
1975	71.186	73.8811	2.6951	3.78599
1976	84.395	87.8691	3.47414	4.11652
1977	86.162	92.229	6.06703	7.04142
1978	88.442	94.8692	6.42717	7.2671
1979	102.986	98.7923	-4.1937	-4.0721

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

PIGSC - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	90.0893	90.5084	0.419106	0.634657
RMS	90.3474	90.6733	3.28282	3.65082
STD.DEV	6.9717	5.58326	3.32599	3.67256



TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

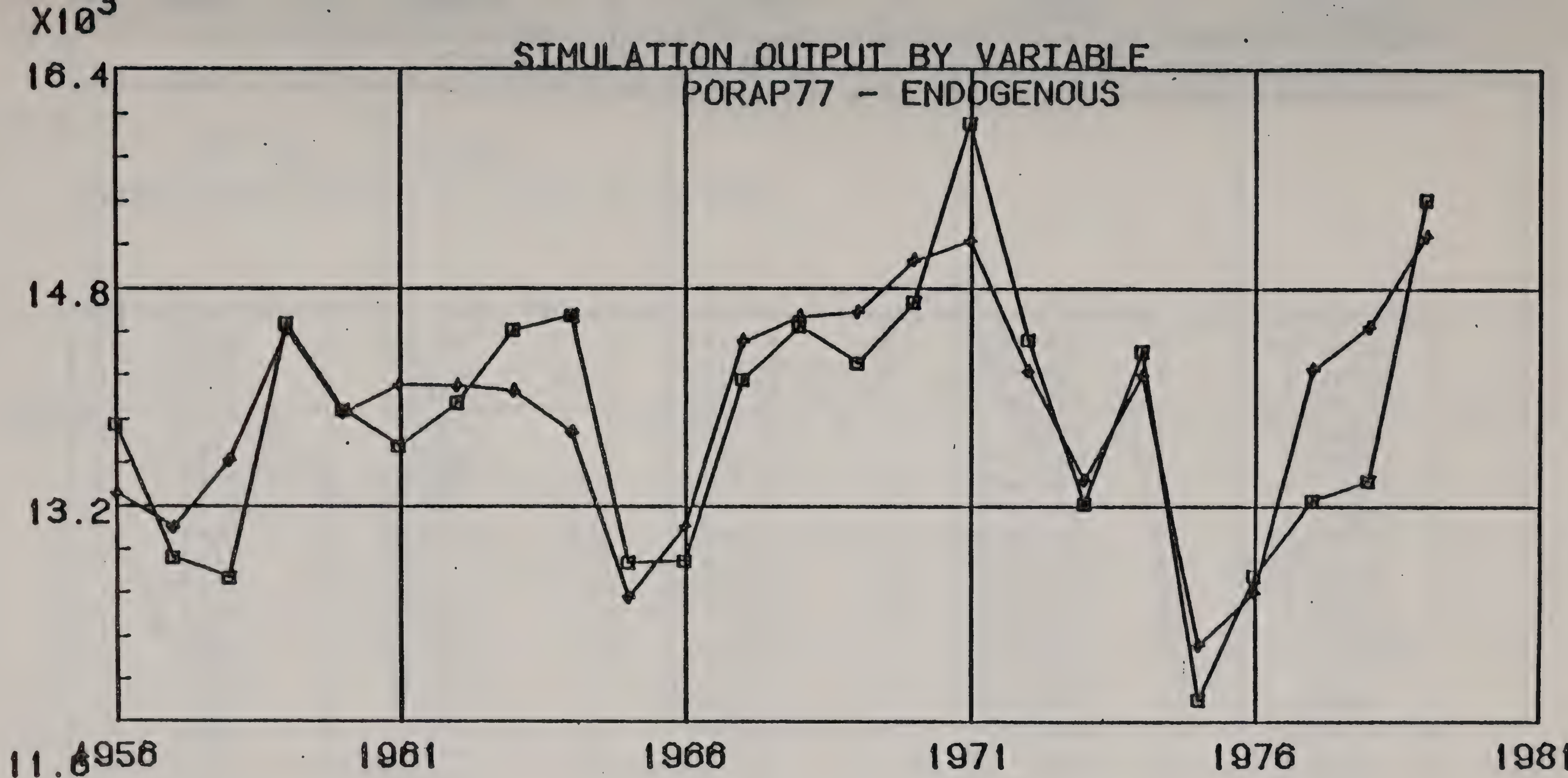
PIGSEBR - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1956	9.209	7.75417	-1.45483	-15.7979
1957	7.65	7.72504	0.075038	0.980888
1958	8.24	7.72587	-0.514134	-6.23949
1959	7.081	7.79498	0.713975	10.083
1960	7.885	7.81324	-0.071756	-0.910036
1961	7.393	7.74855	0.355546	4.80922
1962	7.662	7.7352	0.073204	0.955417
1963	7.96	7.73503	-0.224972	-2.82628
1964	6.561	6.5062	-0.054801	-0.835253
1965	6.175	6.44218	0.267182	4.32684
1966	6.971	6.39194	-0.579058	-8.30666
1967	6.752	6.63159	-0.120405	-1.78325
1968	6.425	6.60146	0.176461	2.74648
1969	6.008	6.51628	0.508283	8.46009
1970	6.634	6.4467	-0.187296	-2.82327
1971	5.52	6.6118	1.09179	19.7789
1972	6.01	6.21393	0.203929	3.39316
1973	5.249	5.60931	0.360314	6.86443
1974	5.265	5.414	0.149004	2.83008
1975	4.724	4.96213	0.238127	5.04079
1976	4.687	5.2928	0.605798	12.9251
1977	5.77	5.46075	-0.309251	-5.35963
1978	5.774	5.08414	-0.689863	-11.9478
1979	5.919	5.48319	-0.435809	-7.36288

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

PIGSEBR - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	6.56349	6.57085	0.007353	0.791743
RMS	6.6609	6.64187	0.516533	7.8493
STD.DEV	1.1594	0.989536	0.527589	7.97723



TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

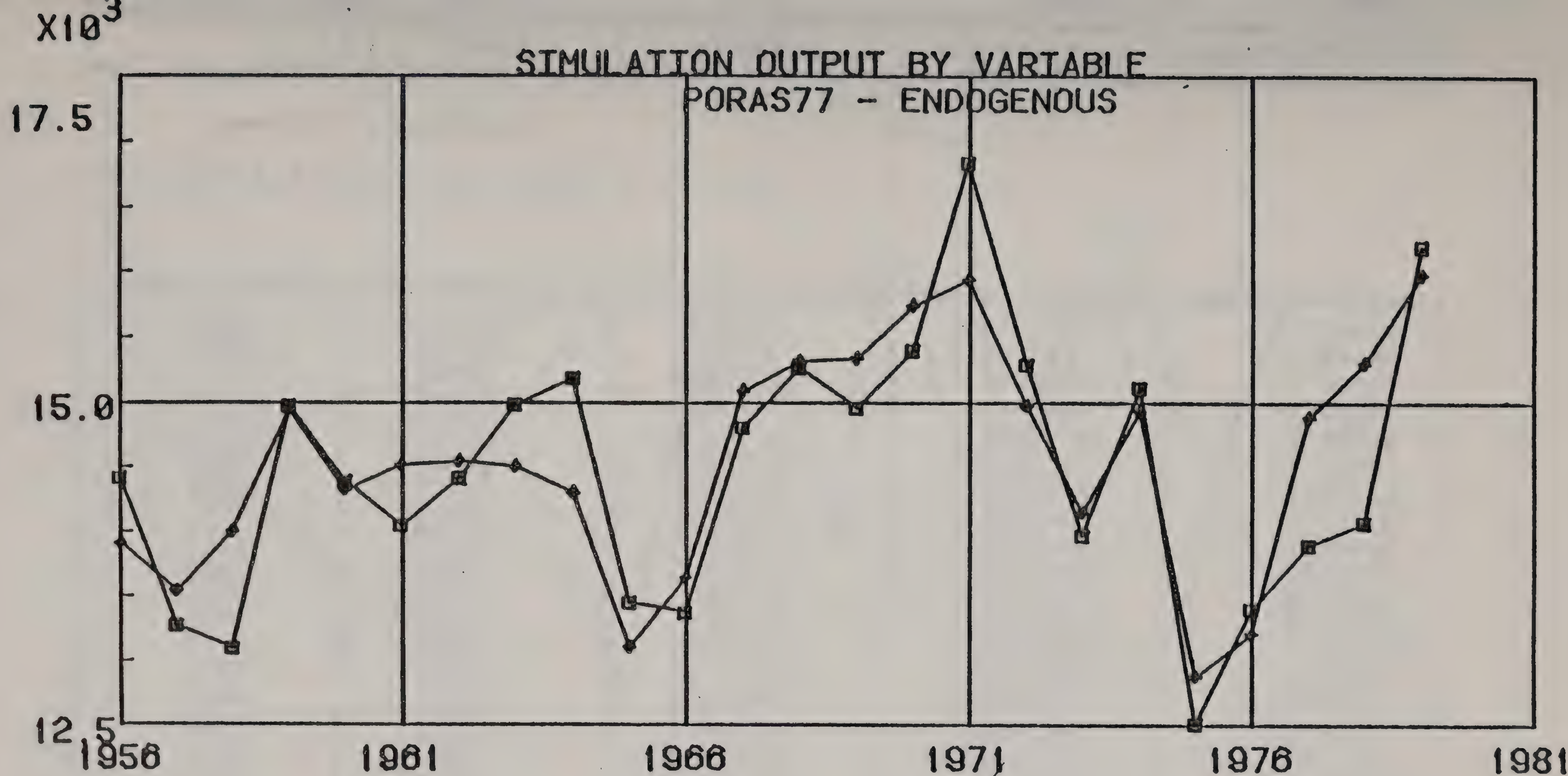
PURAP77 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1956	13804.	13296.7	-507.281	-3.67488
1957	12822.	13042.	219.984	1.71568
1958	12673.	13529.3	856.344	6.75723
1959	14538.	14488.3	-49.6875	-0.341777
1960	13905.	13884.2	-20.8125	-0.149676
1961	13648.	14092.9	444.895	3.25978
1962	13953.	14082.1	129.098	0.925232
1963	14493.	14036.7	-456.316	-3.14853
1964	14598.	13740.6	-857.402	-5.87342
1965	12781.	12524.1	-256.949	-2.0104
1966	12798.	13051.9	253.914	1.98401
1967	14131.	14401.5	270.473	1.91404
1968	14515.	14591.3	76.293	0.525615
1969	14245.	14620.7	375.699	2.63741
1970	14699.	15003.1	304.133	2.06907
1971	16006.	15143.4	-862.613	-5.38931
1972	14422.	14187.3	-234.672	-1.62718
1973	13223.	13384.1	161.145	1.21867
1974	14331.	14161.2	-169.848	-1.18518
1975	11779.	12175.1	396.148	3.36317
1976	12688.	12561.2	-126.793	-0.999314
1977	13247.	14196.3	949.324	7.16633
1978	13393.	14512.4	1119.45	8.35846
1979	15450.	15178.4	-271.602	-1.75794

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

PURAP77 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	13839.2	13911.8	72.6217	0.655711
RMS	13872.3	13935.2	495.739	3.60842
STD_DEV	977.161	823.583	500.938	3.62466



TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

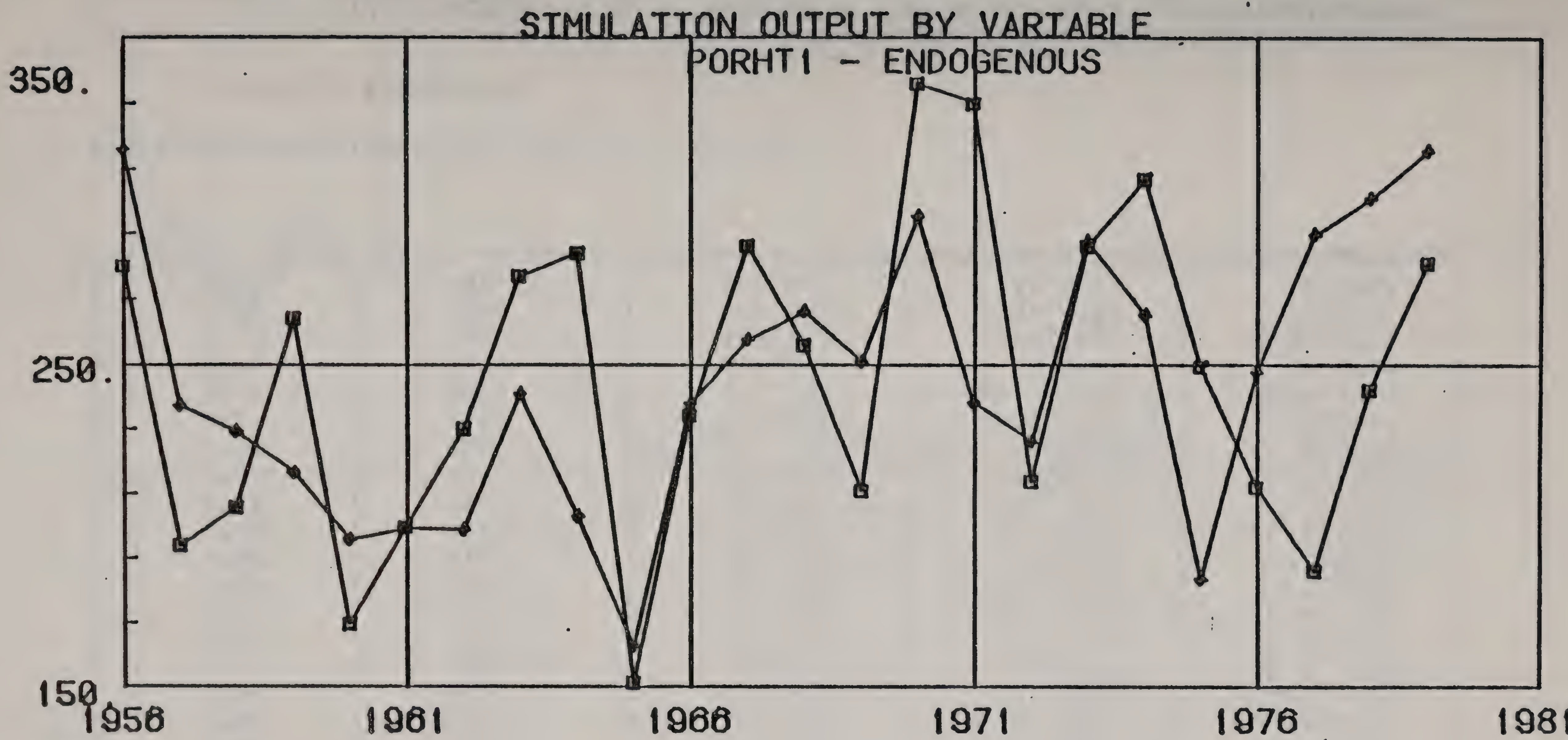
PURAS77 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1956	14411.	13903.7	-507.281	-3.5201
1957	13280.	13535.8	255.805	1.92624
1958	13101.	14000.2	899.234	6.86386
1959	14970.	14943.2	-26.8086	-0.179082
1960	14391.	14322.8	-68.207	-0.473956
1961	14042.	14512.5	470.504	3.35069
1962	14409.	14537.3	128.312	0.890502
1963	14985.	14497.4	-487.574	-3.25375
1964	15188.	14294.5	-893.527	-5.88311
1965	13447.	13108.6	-338.352	-2.51619
1966	13380.	13644.7	264.652	1.97797
1967	14805.	15079.	273.977	1.85057
1968	15263.	15310.5	47.5234	0.311364
1969	14951.	15336.8	385.816	2.58054
1970	15401.	15744.9	343.863	2.23273
1971	16838.	15934.5	-903.484	-5.36575
1972	15290.	14963.5	-326.488	-2.13531
1973	13970.	14143.2	173.199	1.23979
1974	15105.	14936.7	-168.273	-1.11402
1975	12525.	12878.9	353.875	2.82535
1976	13406.	13214.	-191.996	-1.43216
1977	13898.	14882.7	984.664	7.08493
1978	14074.	15297.	1222.97	8.68956
1979	16191.	15977.9	-213.066	-1.31596

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

PURAS77 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	14471.7	14541.7	69.9723	0.60978
RMS	14506.	14566.7	524.148	3.64975
STD_DEV	1019.07	872.6	530.628	3.67585



TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

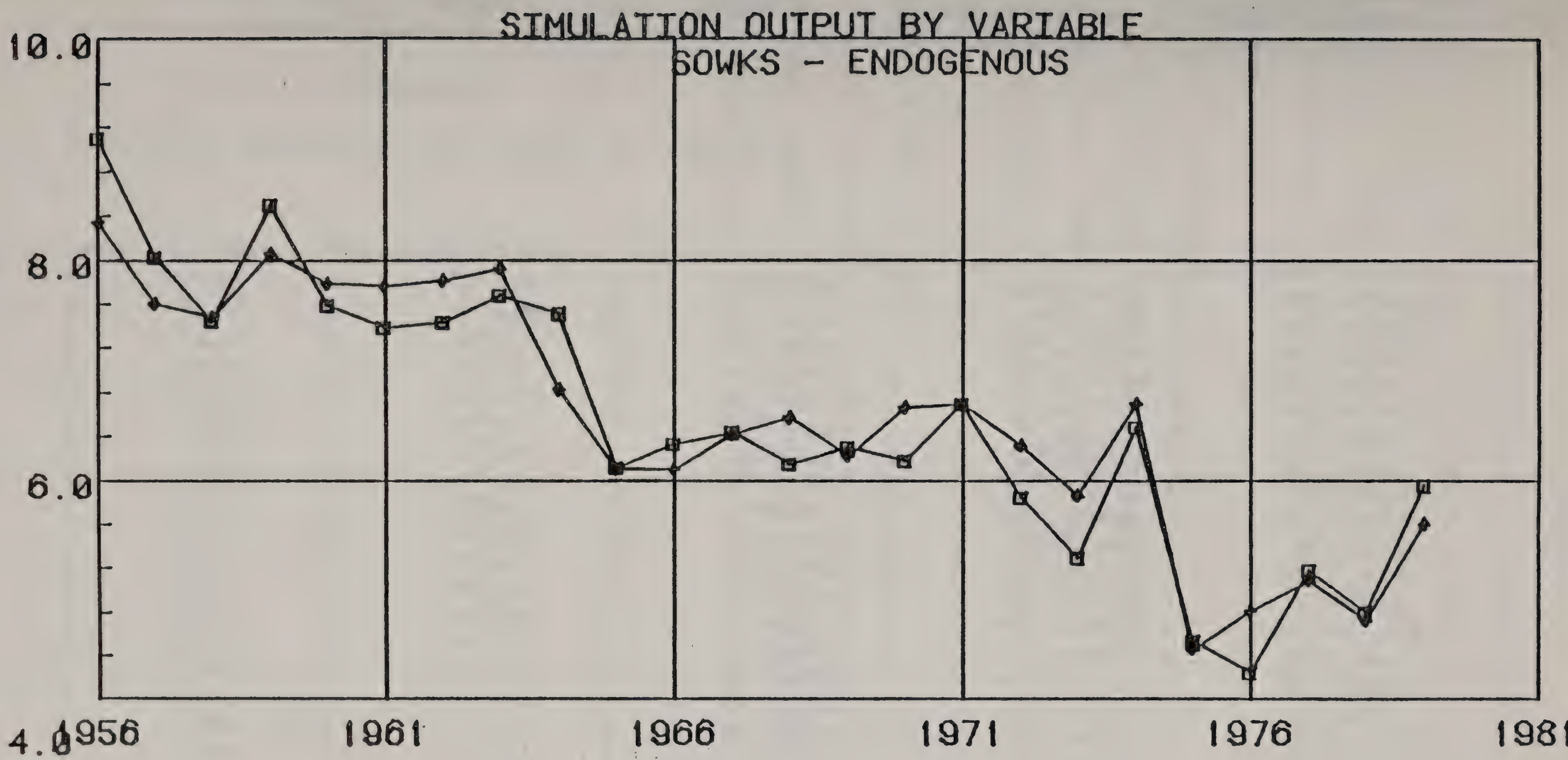
PURHT1 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1956	280.	315.821	35.821	12.7932
1957	194.	236.894	42.8936	22.1101
1958	206.	228.882	22.8821	11.1078
1959	264.	216.605	-47.3945	-17.9525
1960	170.	195.611	25.6106	15.0651
1961	200.	199.218	-0.781982	-0.390991
1962	230.	198.746	-31.2542	-13.5888
1963	277.	240.878	-36.1218	-13.0404
1964	284.	202.598	-81.4016	-28.6625
1965	152.	162.74	10.7397	7.06562
1966	234.	237.504	3.50439	1.4976
1967	286.	257.231	-28.7686	-10.0589
1968	256.	266.121	10.1208	3.95346
1969	211.	250.731	39.7314	18.8301
1970	336.	295.131	-40.8691	-12.1634
1971	330.	238.184	-91.8164	-27.8231
1972	214.	226.055	12.0547	5.63303
1973	286.	287.577	1.57715	0.55145
1974	307.	264.727	-42.2729	-13.7697
1975	249.	183.799	-65.2009	-26.1851
1976	212.	247.341	35.3413	16.6704
1977	186.	289.523	103.523	55.6576
1978	242.	300.535	58.5352	24.1881
1979	281.	315.545	34.5454	12.2937

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

PURHT1 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	245.292	244.083	-1.20839	1.82424
RMS	249.981	247.556	46.0822	19.3287
STD.DEV	49.2275	42.2121	47.0572	19.6562



TIME BOUNDS: 1956 TO 1979

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◇	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

SOWKS - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1956	9.102	8.34151	-0.760492	-8.35522
1957	8.021	7.60432	-0.416684	-5.19491
1958	7.452	7.47112	0.01912	0.256578
1959	8.498	8.05247	-0.445531	-5.24277
1960	7.58	7.77562	0.19562	2.58073
1961	7.384	7.76664	0.382638	5.18199
1962	7.431	7.81101	0.380012	5.11387
1963	7.672	7.91153	0.23953	3.12213
1964	7.512	6.82269	-0.689309	-9.1761
1965	6.117	6.10578	-0.011224	-0.183485
1966	6.333	6.10077	-0.23223	-3.66698
1967	6.428	6.42212	-0.005878	-0.091451
1968	6.139	6.56914	0.430143	7.00673
1969	6.291	6.21698	-0.074018	-1.17656
1970	6.178	6.66437	0.486368	7.87258
1971	6.69	6.6863	-0.003699	-0.055296
1972	5.835	6.31213	0.477125	8.17695
1973	5.294	5.85987	0.565869	10.6889
1974	6.481	6.69613	0.215129	3.31938
1975	4.539	4.45972	-0.07928	-1.74664
1976	4.25	4.8041	0.554099	13.0376
1977	5.177	5.07596	-0.101036	-1.95163
1978	4.794	4.72106	-0.072942	-1.52152
1979	5.952	5.59188	-0.360123	-6.05045

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

SOWKS - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	6.54791	6.5768	0.028884	0.914347
RMS	6.65958	6.66763	0.3734	5.81594
STD_DEV	1.2406	1.12048	0.380288	5.86715

II.3 The U.S. Lamb and Sheep Supply Submodel

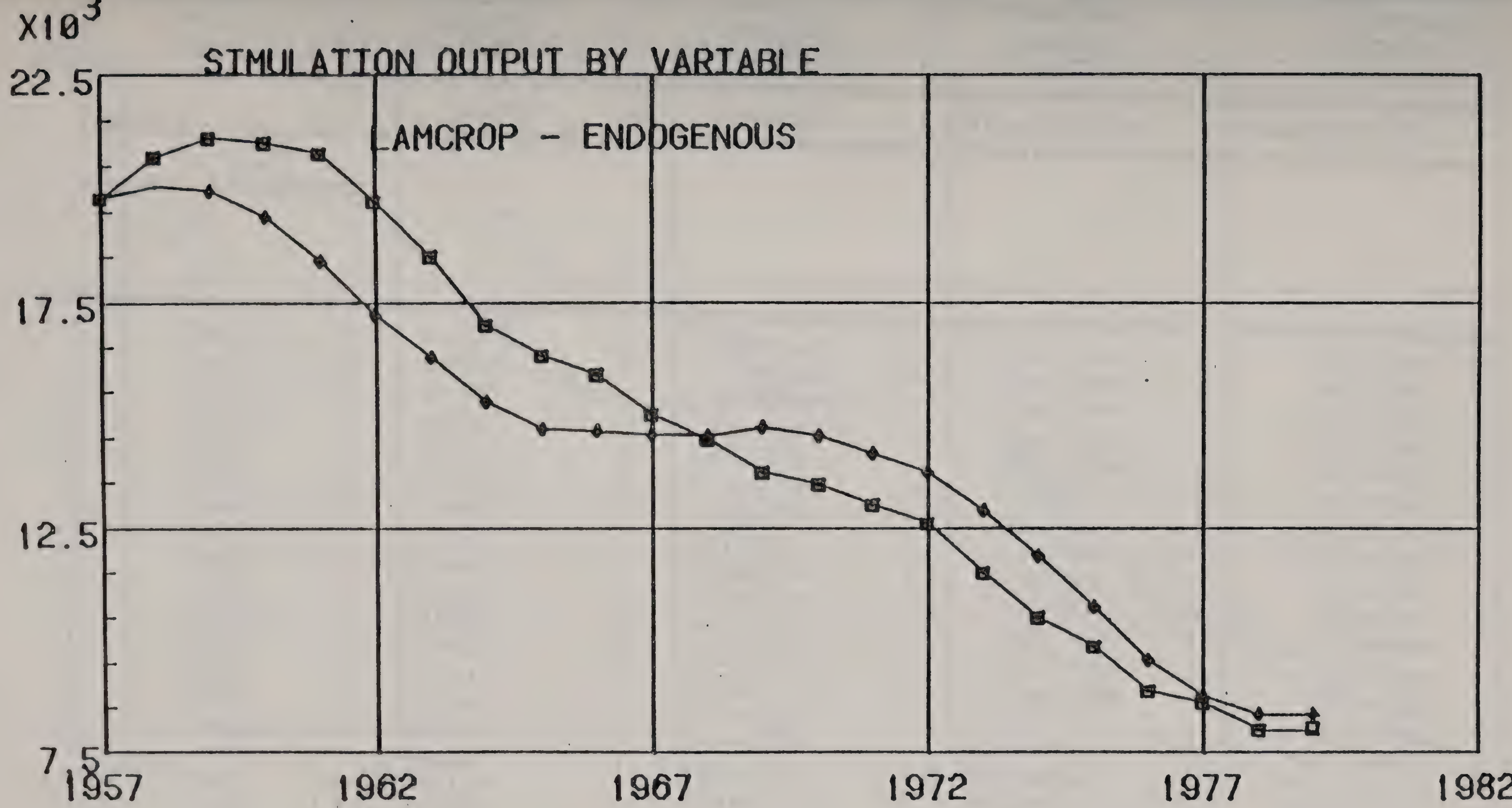
The structure of this model is very similar to the previous supply submodels. A special attribute of this model is the joint production aspects of wool and lamb. This is reflected by the negative effects of the relative price of lamb and the relative price of wool on the amount of lamb and sheep slaughtered.

On the other hand, higher prices for lamb increases lamb production which implies that carcass weight increases.

The effect of an increase in the relative price of wool on wool production is obtained indirectly through an increase in the stocks of lamb and sheep on hand.

The following graphs show the historical simultaneous validation of this submodel. In the Appendix to Section II the statistical properties of the estimated equations and the data are presented.

```
SYMBOL DECLARATIONS

ENDOGENOUS:
   LAMCROP  - LAMB, NUMBER BORN, THOUSAND HEAD
   LAMPROD  - LAMB PRODUCTION, CARCASS WEIGHT, MIL LBS
   LAMSHISL - TOTAL SLAUGHTER (COMMERCIAL AND FARM) OF SHEEP AND LAMB
              THOUSAND HEAD
   LAMSHIST - SHEEP AND LAMB STOCKS ON FARMS, JAN 1, THOUSAND HEAD
   WOOLPROD - WOOL PRODUCTION, THOUSAND LBS

EXOGENOUS:
   CORPF    - CORN, AVERAGE PRICE RECEIVED BY FARMERS, OCT-SEP US, $/BU
   FARWAG   - ANNUAL AVERAGE HOURLY WAGE RATE, $/HR
   LAMPRIF  - AVERAGE PRICE RECEIVED BY FARMERS, LAMB AND SHEEP, $/100 LB
   LAMSHID  - NUMBER OF DEATHS, SHEEP AND LAMBS, THOUSAND HEAD
   WOOLPRIF - AVERAGE PRICE OF WOOL RECEIVED BY FARMERS, CENTS/LB


EQUATIONS

     SHEEP AND LAMB STOCKS ON FARMS:
 1:        LAMSHIST = LAMSHIST(-1)+LAMCROP(-1)-LAMSHISL(-1)-LAMSHID(-1)

     LAMB, NUBER BORN:
 2:        LAMCROP = -153.708+0.61716*LAMSHIST+25.8298*(LAMPRIF/FARWAG+LAMPRIF(-1)/FARWAG(-1))

     TOTAL SLAUGHTER OF SHEEP AND LAMB:
 3:        LAMSHISL = 967.483+0.29815*LAMSHIST+0.5427*LAMSHISL(-1)-61.1476*LAMPRIF/CORPF-19.1507*WOOLPRIF/FARWAG-
           24.6183*WOOLPRIF(-1)/FARWAG(-1)

     WOOL PRODUCTION:
 4:        WOOLPROD = -10659.1+9.27333*LAMSHIST

     LAMP PRODUCTION:
 5:        LAMPROD = 54.5168+0.04031*LAMSHISL+0.07077*LAMPROD(-1)+0.30387*(LAMPRIF/CORPF+LAMPRIF(-1)/CORPF(-1))
```



TIME BOUNDS: 1957 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◇ #1 SIMULATE

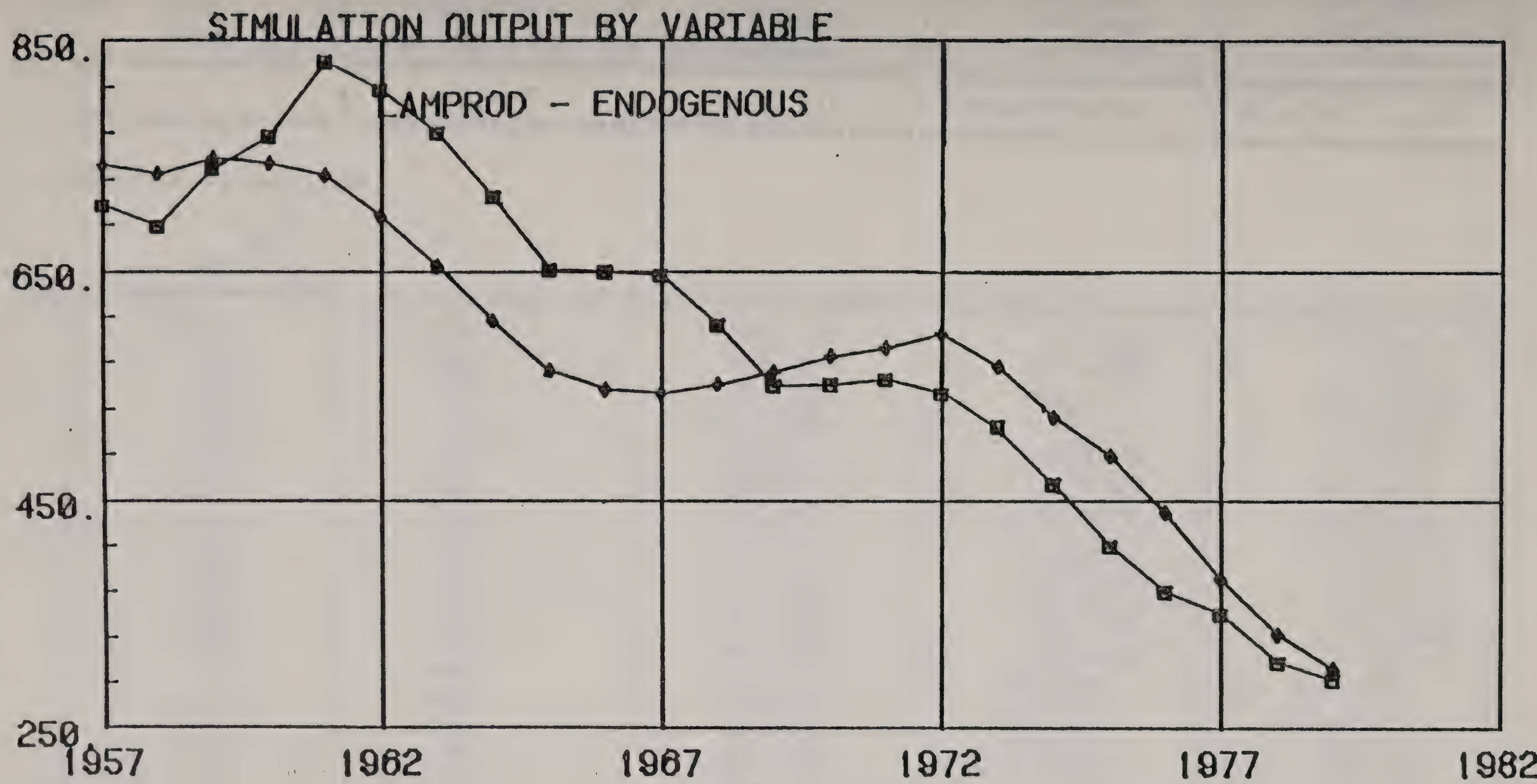
SIMULATION OUTPUT BY VARIABLE

LAMCKUP - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1957	19810.	19807.9	-2.14062	-0.010806
1958	20686.	20053.6	-632.383	-3.05706
1959	21120.	19940.3	-1179.7	-5.58568
1960	21012.	19363.7	-1648.27	-7.8444
1961	20782.	18404.9	-2377.05	-11.438
1962	19712.	17209.5	-2502.52	-12.6954
1963	18516.	16259.5	-2256.51	-12.1868
1964	16994.	15287.6	-1706.4	-10.0412
1965	16312.	14661.9	-1650.13	-10.1161
1966	15881.	14649.5	-1231.5	-7.75457
1967	15017.	14577.4	-439.633	-2.92757
1968	14443.	14526.4	83.418	0.577566
1969	13723.	14709.4	986.418	7.18806
1970	13465.	14507.6	1042.63	7.74325
1971	12998.	14155.2	1157.24	8.9032
1972	12599.	13736.1	1137.09	9.02523
1973	11500.	12859.4	1359.44	11.8212
1974	10509.	11873.3	1364.34	12.9826
1975	9857.	10735.9	878.875	8.91625
1976	8888.	9579.03	691.027	7.77483
1977	8606.	8752.66	146.664	1.70421
1978	8020.	8362.51	342.508	4.27067
1979	8043.	8335.73	292.727	3.63952

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	14717.1	14449.9	-267.124	0.038657
RMS	15367.4	14888.6	1297.84	8.2614
STD.DEV	4522.64	3668.	1298.59	8.44698



TIME BOUNDS: 1957 TO 1979

SYMBOL SCALE NAME

SYMBOL	SCALE	NAME
◻	#1	ACTUAL
♦	#1	SIMULATE

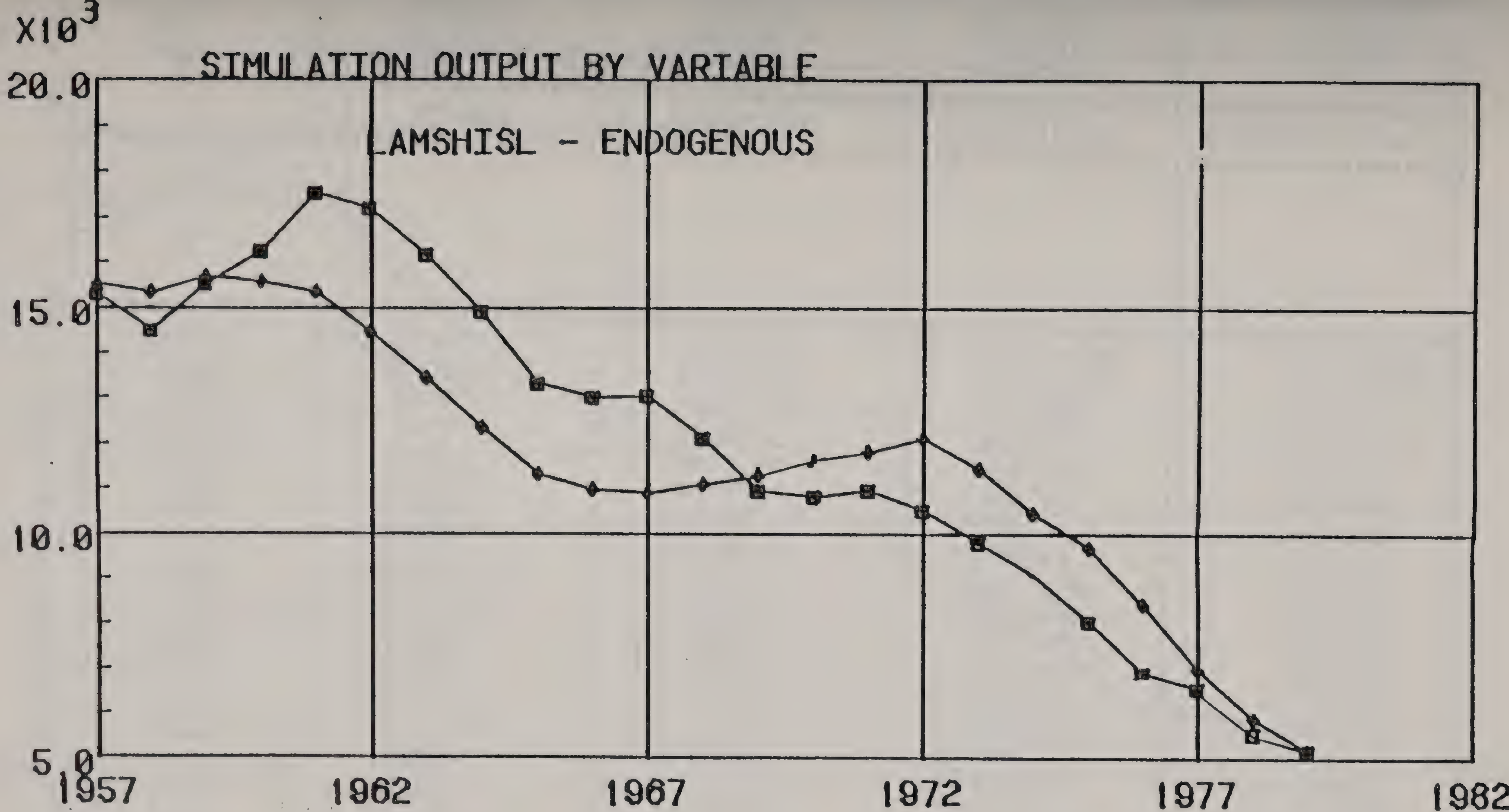
SIMULATION OUTPUT BY VARIABLE

LAMPROD - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1957	707.	741.704	34.7041	4.90864
1958	688.	734.774	46.7737	6.7985
1959	738.	747.676	9.67603	1.31111
1960	768.	743.455	-24.5447	-3.19592
1961	832.	732.812	-99.1885	-11.9217
1962	809.	697.27	-111.73	-13.8109
1963	770.	653.951	-116.049	-15.0713
1964	715.	606.732	-108.268	-15.1424
1965	651.	563.039	-87.9614	-13.5117
1966	650.	546.879	-103.121	-15.8647
1967	646.	542.446	-103.554	-16.03
1968	602.	551.459	-50.5405	-8.39543
1969	550.	560.992	10.9917	1.99849
1970	551.	574.567	23.5667	4.27707
1971	555.	582.287	27.2874	4.91664
1972	543.	594.309	51.3088	9.44914
1973	514.	566.009	52.0085	10.1184
1974	465.	522.403	57.4033	12.3448
1975	410.	488.668	78.6685	19.1874
1976	371.	439.283	68.2832	18.4052
1977	351.	380.702	29.7021	8.46215
1978	309.	332.914	23.9138	7.7391
1979	293.	302.326	9.32568	3.18283

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	586.435	574.201	-12.2323	0.006755
RMS	607.353	587.717	67.7892	11.1751
STD.DEV	161.576	128.132	68.175	11.4263



TIME BOUNDS: 1957 TO 1979

SYMBOL SCALE NAME

SYMBOL	SCALE	NAME
□	#1	ACTUAL
♦	#1	SIMULATE

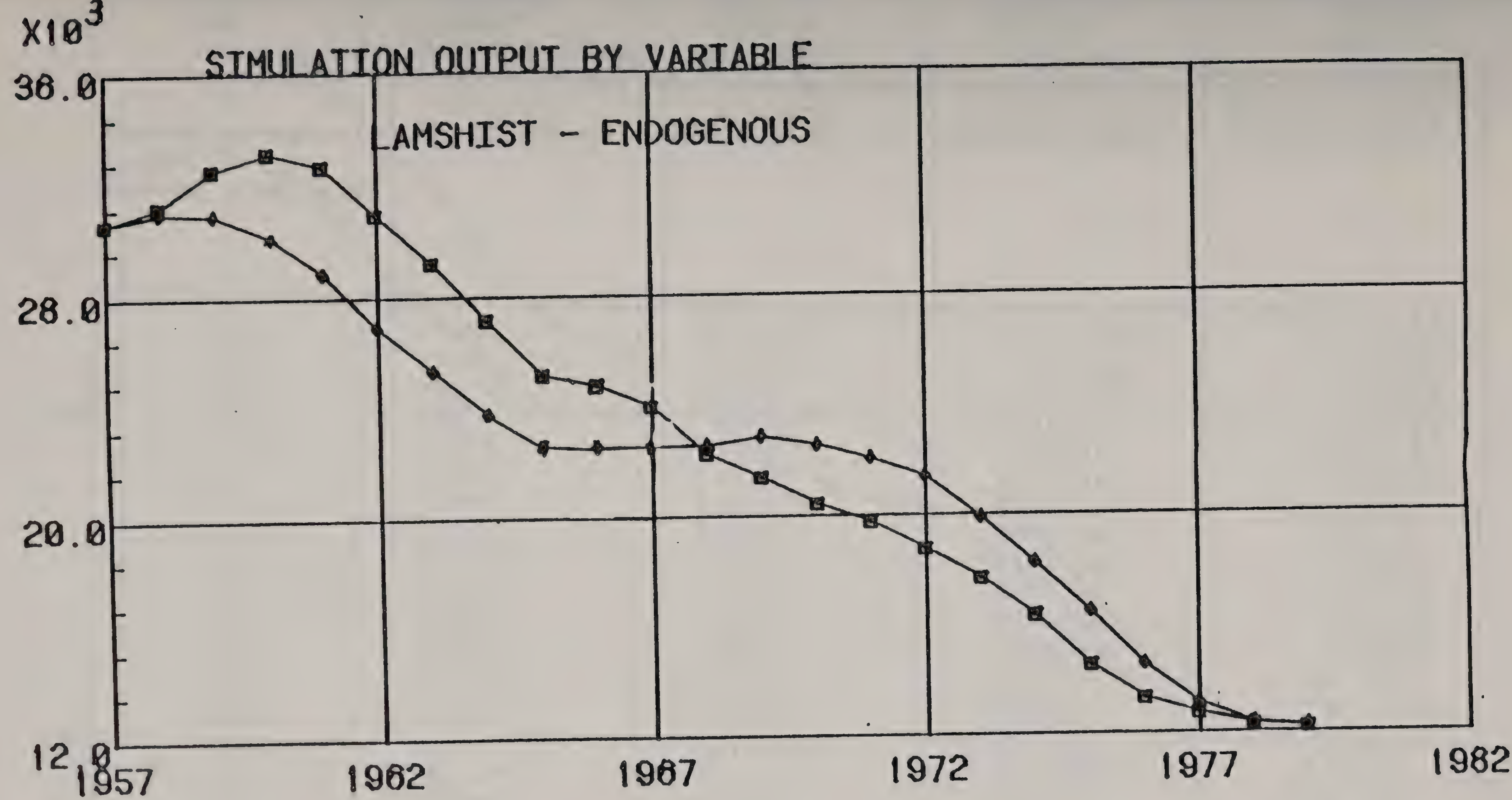
SIMULATION OUTPUT BY VARIABLE

LAHSHISL - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1957	15292.	15523.7	231.742	1.51545
1958	14495.	15317.6	822.645	5.67537
1959	15528.	15651.4	123.398	0.794683
1960	16240.	15534.5	-705.516	-4.34431
1961	17537.	15305.4	-2231.63	-12.7253
1962	17168.	14456.6	-2711.42	-15.7935
1963	16147.	13431.8	-2715.19	-16.8154
1964	14895.	12329.6	-2565.44	-17.2235
1965	13300.	11303.7	-1996.25	-15.0094
1966	13005.	10966.4	-2038.64	-15.6758
1967	13036.	10876.2	-2159.84	-16.5682
1968	12121.	11081.6	-1039.41	-8.57528
1969	10924.	11286.1	362.066	3.31441
1970	10801.	11622.9	821.93	7.60975
1971	10965.	11788.	822.965	7.50537
1972	10525.	12083.9	1558.87	14.8112
1973	9799.	11428.7	1629.7	16.6313
1974	9064.	10440.	1375.97	15.1806
1975	8047.	9662.46	1615.46	20.0753
1976	6911.	8430.8	1519.8	21.9911
1977	6555.	7006.59	451.594	6.8893
1978	5543.	5885.36	342.355	6.17636
1979	5189.	5186.73	-2.26953	-0.043737

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	11873.3	11591.3	-282.048	0.234596
RMS	12432.2	11958.	1548.06	12.6624
STD.DEV	3768.36	3004.51	1556.36	12.9447



TIME BOUNDS: 1957 TO 1979

SYMBOL SCALE NAME

□	#1	ACTUAL
◆	#1	SIMULATE

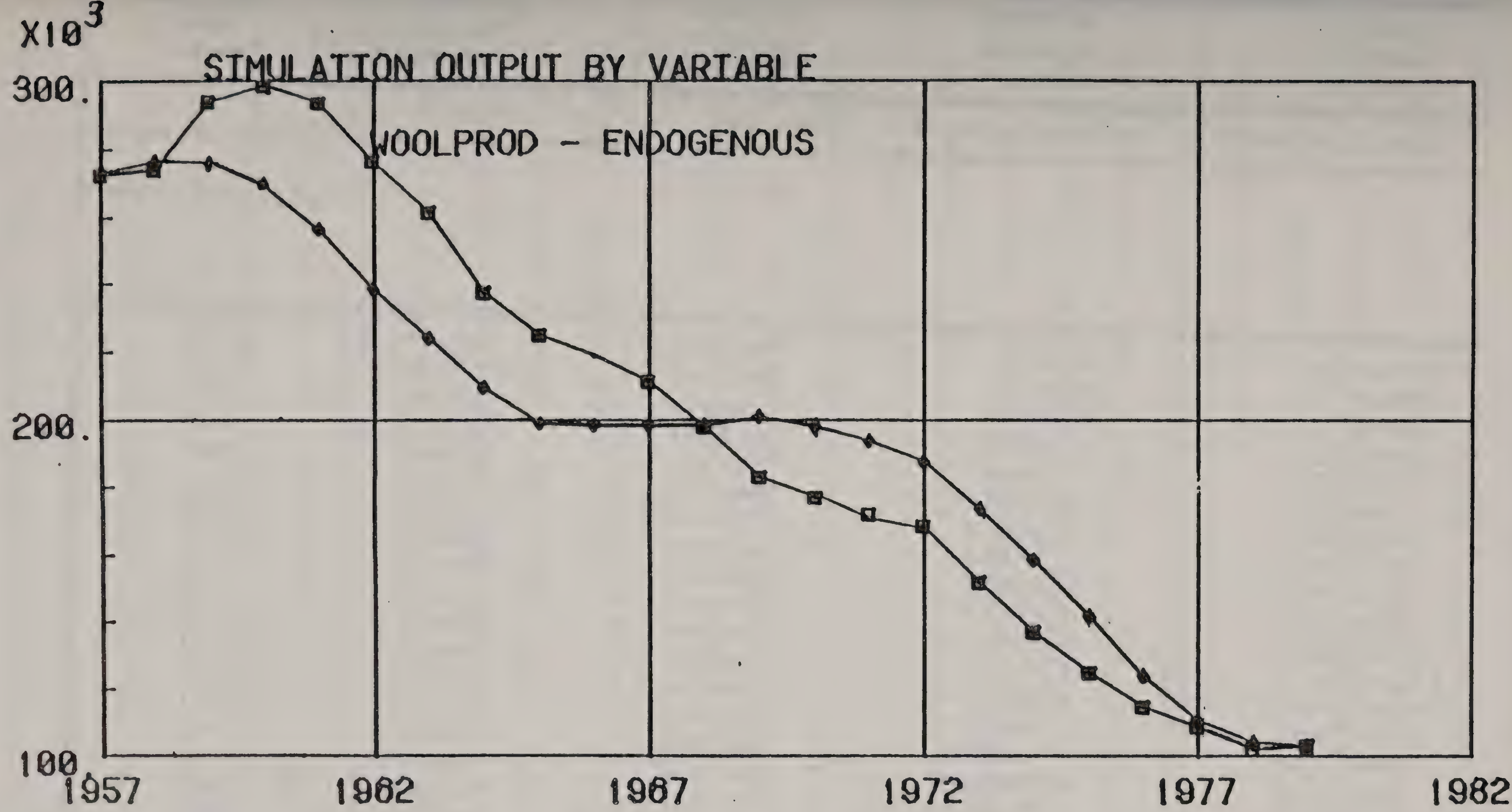
SIMULATION OUTPUT BY VARIABLE

LAMSHIST - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1957	30654.	30654.	0.	0.
1958	31217.	30983.1	-233.883	-0.749216
1959	32606.	30917.1	-1688.91	-5.17975
1960	33170.	30178.	-2992.	-9.02021
1961	32725.	28790.2	-3934.75	-12.0237
1962	30969.	26888.8	-4080.17	-13.175
1963	29176.	25304.7	-3871.27	-13.2687
1964	27116.	23703.4	-3412.59	-12.5852
1965	25127.	22573.5	-2553.55	-10.1626
1966	24734.	22526.6	-2207.43	-8.92467
1967	23953.	22552.7	-1400.29	-5.846
1968	22223.	22542.9	319.91	1.43954
1969	21350.	22792.7	1442.74	6.75755
1970	20423.	22490.1	2067.09	10.1214
1971	19731.	22018.8	2287.79	11.5949
1972	18739.	21361.1	2622.06	13.9925
1973	17641.	19841.3	2200.28	12.4725
1974	16310.	18240.	1930.01	11.8333
1975	14515.	16433.4	1918.38	13.2165
1976	13311.	14492.8	1181.8	8.87837
1977	12766.	13119.	353.023	2.76534
1978	12348.	12396.1	48.0937	0.389486
1979	12220.	12268.2	48.2461	0.394812

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	22740.2	22307.3	-432.845	0.127017
RMS	23818.2	23034.2	2248.81	9.36207
STD.DEV	7243.87	5870.1	2256.35	9.57159



TIME BOUNDS: 1957 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

WOOLPROD - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1957	272701.	273605.	904.5	0.331682
1958	274113.	276657.	2544.5	0.928267
1959	294439.	276045.	-18393.8	-6.24707
1960	298877.	269191.	-29685.6	-9.93239
1961	293661.	256322.	-37338.7	-12.7149
1962	276536.	238690.	-37846.2	-13.6858
1963	261246.	224000.	-37246.1	-14.2571
1964	237433.	209150.	-28282.6	-11.9118
1965	224763.	198672.	-26091.1	-11.6083
1966	219153.	198237.	-20915.8	-9.54393
1967	211384.	198480.	-12904.4	-6.10474
1968	197896.	198389.	492.687	0.248963
1969	182849.	200705.	17856.4	9.76567
1970	176787.	197899.	21111.9	11.942
1971	172156.	193528.	21372.3	12.4145
1972	168206.	187429.	19223.	11.4282
1973	151738.	173336.	21597.6	14.2335
1974	137082.	158486.	21404.5	15.6144
1975	124835.	141733.	16898.	13.5363
1976	114817.	123737.	8920.37	7.76921
1977	108859.	110998.	2138.87	1.96481
1978	102424.	104294.	1869.94	1.82568
1979	103063.	103108.	45.3125	0.043966

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	200218.	196204.	-4014.11	0.26266
RMS	210735.	203299.	21278.8	10.0344
STD.DEV	67219.5	54435.5	21366.4	10.2564

II.4 The U.S. Poultry Supply Submodel

This model comprises two interrelated components: a) chicken and eggs, and b) turkey. Since turkey and chicken are substitutes from the consumers point of view and the industry is highly concentrated, it is highly likely that stock decisions in turkey depend among other things on the stocks of chicken. Therefore, the interrelations between these two components is through the stock equations.

In the chicken component we differentiate among broilers, non-broilers and laying hens. Meat is produced by broilers and non-broilers and eggs are produced by laying hens. Meat production is affected positively by a two year moving average of the pertinent chicken prices relative to feed costs. It is also affected by the initial stocks of laying hens in the case of non-broiler production and by the initial stocks of broiler chicken and hatching eggs in the case of broiler production. Because of the fast turn-over in broiler production, the higher the initial stocks, the lower current production will be. On the other hand, the higher the availability of hatching eggs, the more broiler chicken can be produced. Similarly, the average number of laying hens is affected positively by a two year moving average of egg prices relative to feed costs.

Egg prices did not show any meaningful relation to the average number of eggs laid per chicken neither could be found any measurable index of technological improvement which would affect in a meaningful way the average number of eggs laid per chicken. In the absence of any other alternative a time trend was included in the specification of egg yields.

The specification of the turkey component is simpler since it is a relatively less important industry. As it is with chicken, a two year moving average of turkey prices relative to feeding costs is shown to affect positively the amount produced of turkey meat.

Following are the historical simultaneous solutions of the poultry supply model. The statistical properties of the estimated equations and

```
MODEL: POULTRY

SYMBOL DECLARATIONS

ENDOGENOUS:
   CHIAPOT  - CHICKENS, OTHER, PRODUCTION, RTC, US, MIL LBS
   CHIASOT  - CHICKENS, OTHER, TOTAL SYPPLY, US, MIL LBS
   CHIASYO  - CHICKENS, YOUNG, TOTAL SUPPLY, US, MIL LBS
   CHIMTOT1 - CHICKENS, OTHER, RTC, ENDING STOCKS, MIL LBS
   CHIMTYO1 - CHICKENS, YOUNG, RTC, ENDING STOCKS, MIL LBS
   CHISPYO  - CHICKENS, YOUNG, PRODUCTION, RTC, US, MIL LBS
   CHISVLA  - CHICKENS, LAYERS, NUMBER ON FARMS, US, MIL HEAD
   EGGAAD   - EGGS, NUMBER PRODUCED PER LAYER ON HAND DURING YEAR, US,
              NUMBER OF DOZEN
   EGGAP    - EGGS PRODUCTION, US, MIL DOZ
   EGGAS    - EGGS, SUPPLY, US, MIL DOZ
   EGGBB    - EGGS USED FOR HATCHING, MIL DOZ
   EGGHT    - EGGS, ENDING STOCKS, US, MIL DOZ
   TURAP    - TURKEY, PRODUCTION, RTC, US, MIL LBS
   TURAS    - TURKEY, SUPPLY, RTC, US, MIL LBS
   TURHT1   - TURKEY, ENDING STOCKS, MIL LBS

DEFINITION:
   FDC      - FEEDING COST INDEX IN THE PRODUCTION OF BROILERS
   FDE      - FEEDING COST INDEX IN THE PRODUCTION OF EGGS

EXOGENOUS:
   BARPF    - BARLEY, AVERAGE PRICE RECEIVED BY FARMERS, US, $/BU
   CHIPWBR9 - BROILERS, 9-CITY WHOLESALE PRICE, RTC, CENTS/LB
   CHIPWXB  - CHICKENS, NONBROILER, WHOLESALE PRICE, US, CENTS/LB
   CORPF    - CORN, AVE PRICE RECEIVED BY FARMERS, OCT-SEP US, $/BU
   DUM61    - DUMMY VARIABLE, 1961=1, OTHERS=0
   DUM67    - DUMMY VARIABLE, 1967=1, OTHERS=0
   DUM74    - DUMMY VARIABLE, 1974=1, OTHERS=0
   EGGMI    - EGG, IMPORTS, US, MIL DOZ
   EGGPF    - EGG, AVERAGE PRICE RECEIVED BY FARMERS, US, CENTS/DOZ
   FARWAG   - ANNUAL AVERAGE HOURLY WAGE RATE, $/HR
   OATPF    - OATS, AVERAGE PRICE RECEIVED BY FARMERS, JUL-JE, US, $/BU
   PTTIME   - YEAR
   SOMPF    - SOYBEAN MEAL PRICE, US(C.Y.), CENTS/LB
   SORPF    - SORGHUM, FARM PRICE, OCT YR, $/BU
   TURPF    - TURKEYS, LIVEWEIGHT, AVERAGE PRICE RECEIVED BY FARMERS, US,
              CENTS/LB
   WHEPF    - WHEAT, AVERAGE PRICE RECEIVED BY FARMERS, JUL-JE, US, $/BU
```

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  FEEDING COST INDEX IN THE PRODUCTION OF EGGS;
1;       FDE == 0.4838*CORPF+0.0852*SORPF+0.1263*OATPF+0.032*BARPF+0.0027*WHEPF+0.25*SOMPF

  FEEDING COST INDEX IN THE PRODUCTION OF BROILERS;
2;       FDC == 0.6081*CORPF+0.0513*SORPF+0.0173*OATPF+0.0044*BARPF+0.0031*WHEPF+0.3157*SOMPF

  PRODUCTION OF NON BROILER CHICKEN;
3;       CHIAPOT = 188.607+1.67471*CHISVLA(-1)+70.5274*DUM74+6.2613*(CHIPWXB/FDE+CHIPWXB(-1)/FDE(-1))

  PRODUCTION OF BROILER CHICKEN;
4;       CHISPYO = -11905.4-21.0696*CHIHTYO1(-1)+34.6194*(CHIPWBR9/FDC+CHIPWBR9(-1)/FDC(-1))+14.6462*EGGBB(-1)+
         198.733*PTTIME

  ENDING STOCKS OF BROILER CHICKEN;
5;       CHIHTYO1 = 57.023-0.00254*CHISPYO+0.29659*CHIHTOT1-4.88345*(CHIPWBR9/CHIPWXB+CHIPWBR9(-1)/CHIPWXB(-1))

  ENDING STOCKS OF NON BROILER CHICKEN;
6;       CHIHTOT1 = -212.147+0.39774*CHIAPOT-1.26042*CHIHTYO1(-1)+9.6421*(CHIPWBR9/CHIPWXB+CHIPWBR9(-1)/CHIPWXB
         (-1))

  TOTAL DOMESTIC SUPPLY OF BROILER CHICKEN;
7;       CHIASYO = CHIHTYO1(-1)+CHISPYO

  TOTAL DOMESTIC SUPPLY OF NON BROILER CHICKEN;
8;       CHIASOT = CHIHTOT1(-1)+CHIAPOT

  NUMBER OF LAYERS;
9;       CHISVLA = 57.6999+0.73639*CHISVLA(-1)+0.54905*(EGGPF/FDE+EGGPF(-1)/FDE(-1))

  NUMBER OF EGGS PER LAYER;
10;      EGGAAD = 8.20301+0.40311*EGGAAD(-1)-0.0062*CHISVLA+0.06902*PTTIME

  TOTAL CURRENT PRODUCTION OF EGGS;
11;      EGGAP = CHISVLA*EGGAAD

  EGGS FOR HATCHING;
12;      EGGBB = -73.5114+1.52483*CHISVLA+0.03138*CHISPYO-0.79095*CHISVLA(-1)

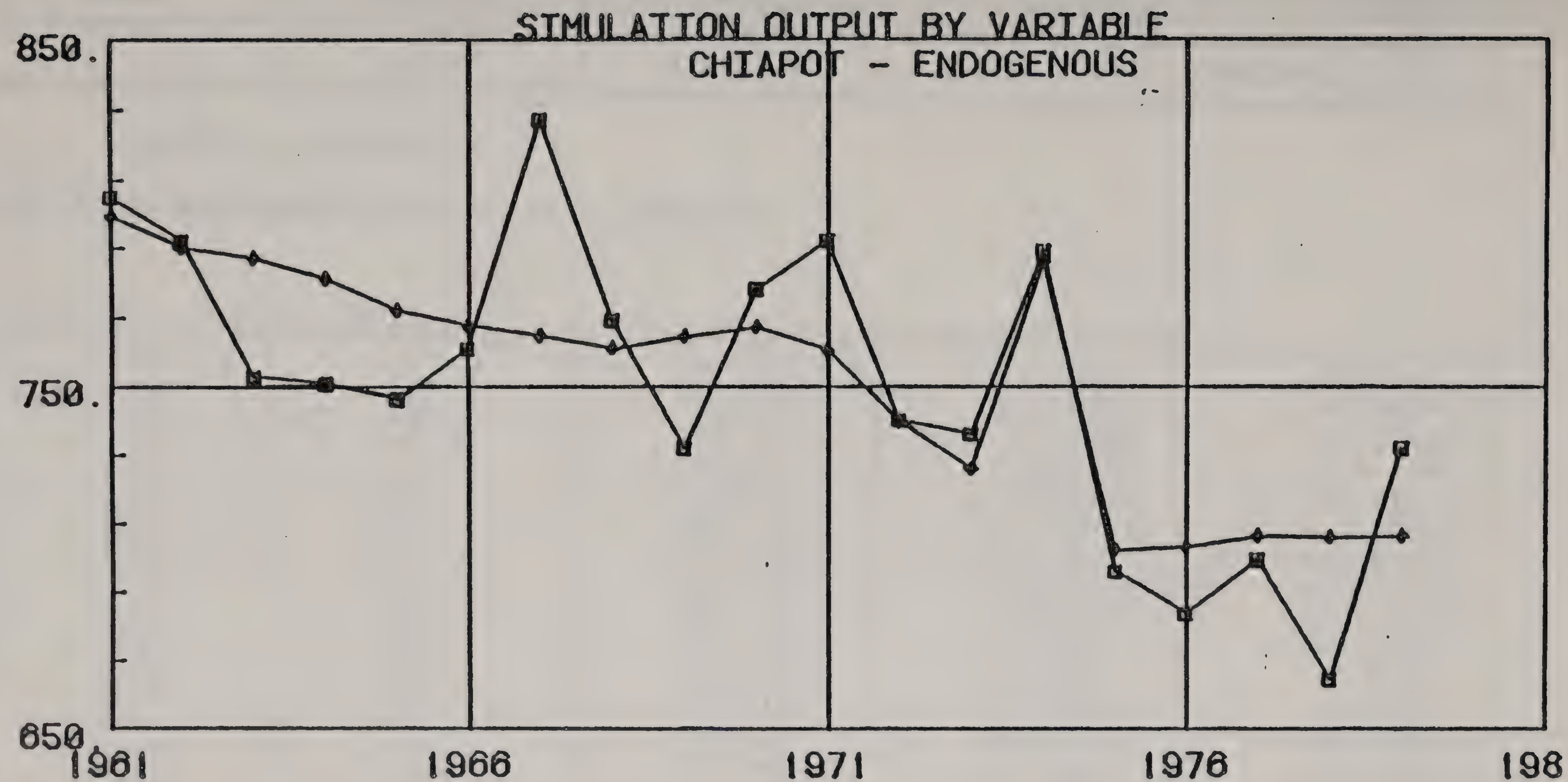
  ENDING STOCKS OF EGGS;
13;      EGGHT = -77.1276+0.59243*EGGHT(-1)+0.30025*CHISVLA+22.6877*DUM67-1.77578*(EGGPF/FARWAG-EGGPF(-1)/
         FARWAG(-1))

  TOTAL SUPPLY OF EGGS;
14;      EGGAS = EGGHT(-1)+EGGMI+EGGAP

  DOMESTIC PRODUCTION OF TURKEY;
15;      TURAP = -1568.57-0.571*TURHT1(-1)+293.324*DUM67-1148.31*(CORPF/TURPF+CORPF(-1)/TURPF(-1))+153.242*
         DUM61+51.0447*PTTIME

  ENDING STOCKS OF TURKEY;
16;      TURHT1 = -631.282+0.60842*TURHT1(-1)+0.20845*TURAS+2.69924*CHIHTYO1+6.56532*(TURPF/FARWAG+TURPF(-1)/
         FARWAG(-1))

  DOMESTIC SUPPLY OF TURKEY;
17;      TURAS = TURHT1(-1)+TURAP
```



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□	#1	ACTUAL
◊	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

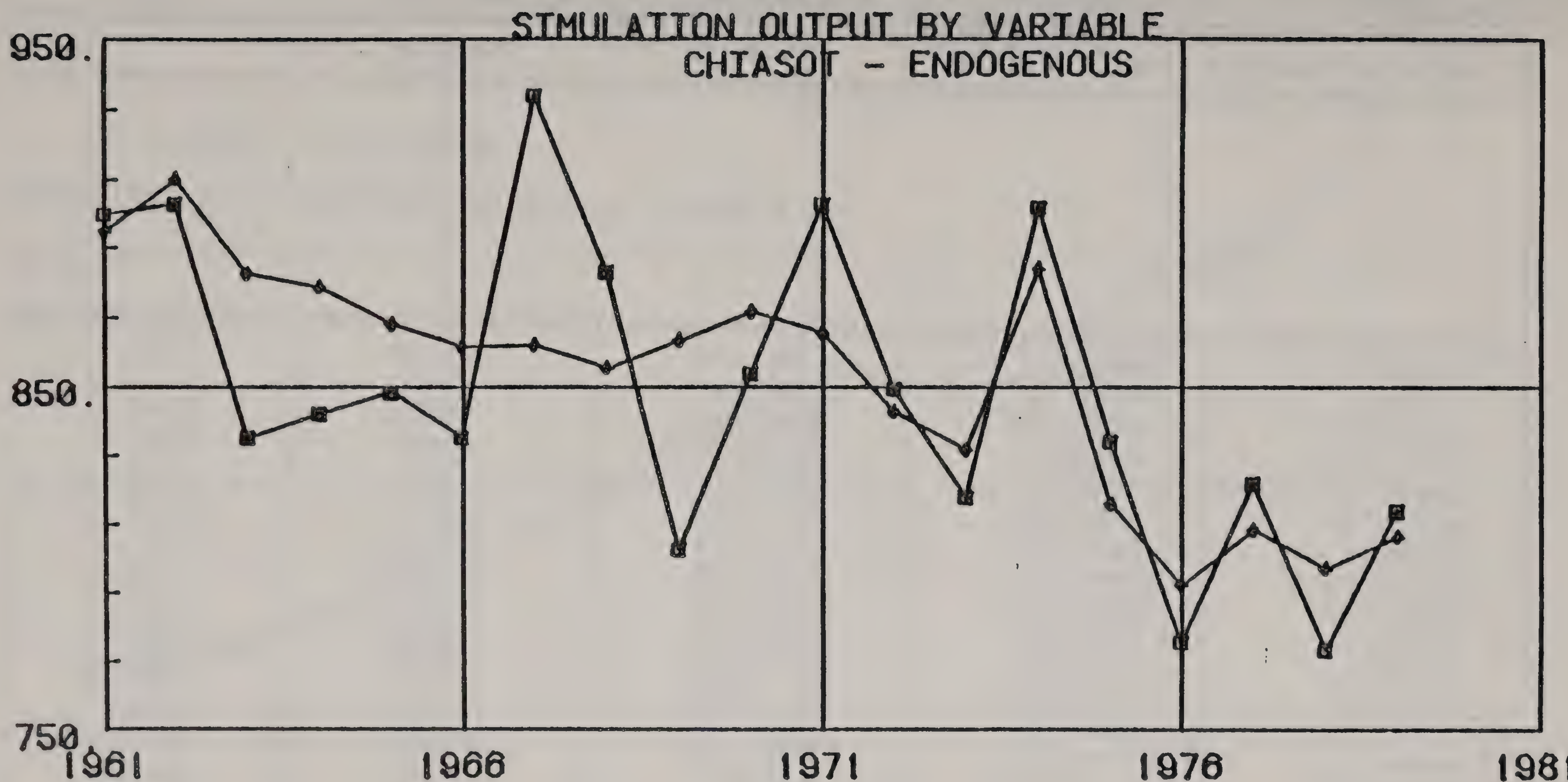
CHIAPOT - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	805.	799.466	-5.53418	-0.687476
1962	792.	790.206	-1.79443	-0.22657
1963	753.	787.19	34.1902	4.54053
1964	751.	781.006	30.0056	3.99542
1965	746.	772.012	26.0122	3.48689
1966	761.	767.498	6.49829	0.853914
1967	827.	764.577	-62.4233	-7.54817
1968	769.	760.973	-8.02734	-1.04387
1969	732.	764.424	32.4238	4.42948
1970	778.	766.687	-11.3125	-1.45405
1971	792.	760.184	-31.8162	-4.01719
1972	740.	739.886	-0.114014	-0.015407
1973	736.	725.997	-10.0027	-1.35906
1974	789.	785.934	-3.06641	-0.388645
1975	696.	702.413	6.41309	0.92142
1976	684.	703.246	19.2456	2.81368
1977	700.	706.13	6.13037	0.875767
1978	665.	706.008	41.0083	6.16666
1979	732.	706.062	-25.9377	-3.54341

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

CHIAPOT - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	749.895	752.099	2.20519	0.410523
RMS	751.06	752.808	25.0133	3.30902
STD.DEV	42.9701	33.5396	25.5987	3.37343



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

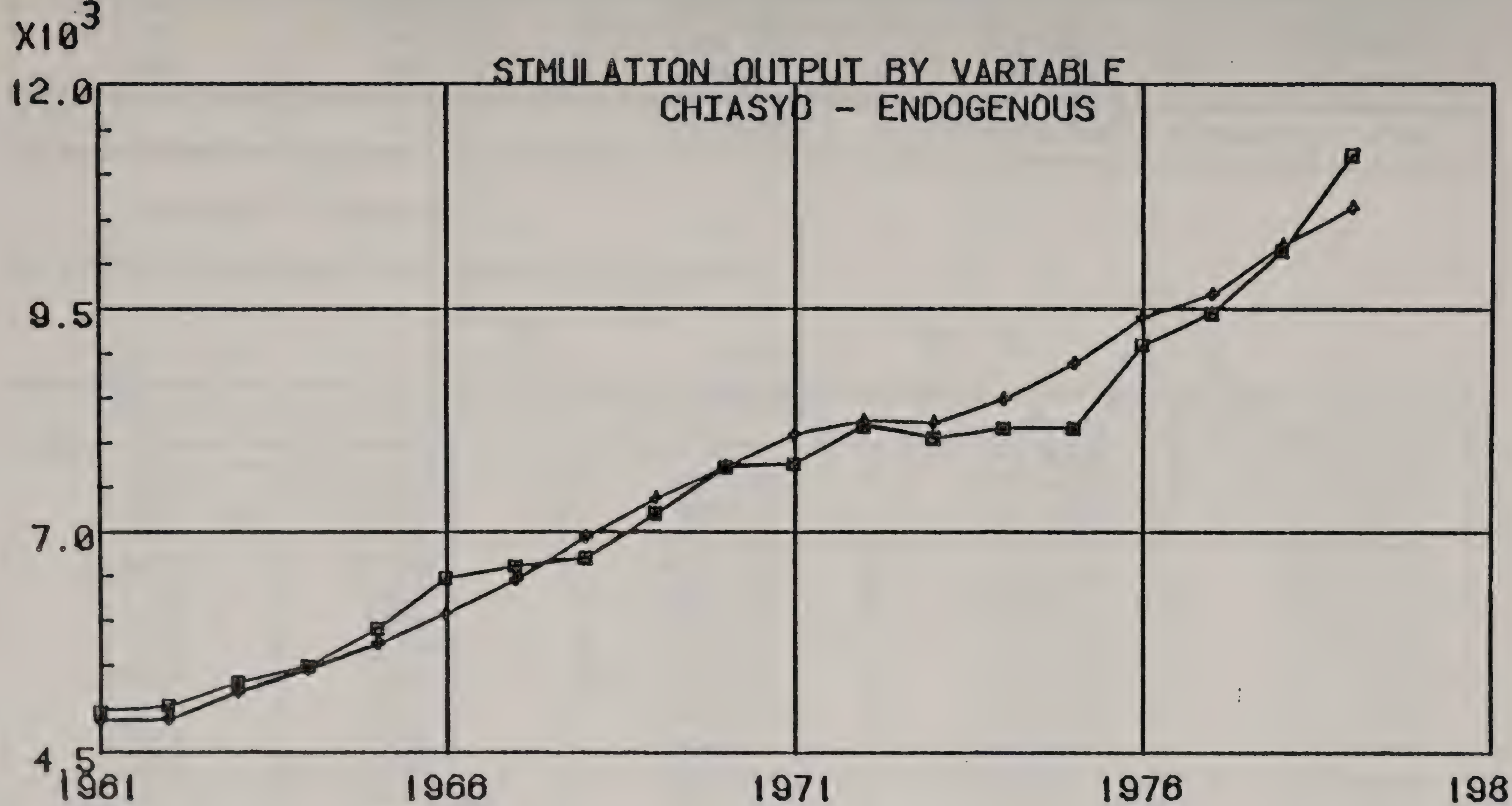
CHIASUT - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	900.	894.466	-5.53418	-0.614909
1962	903.	910.024	7.02417	0.77787
1963	835.	882.579	47.5793	5.69812
1964	842.	878.736	36.7358	4.36293
1965	848.	868.147	20.147	2.37582
1966	835.	861.558	26.5583	3.18064
1967	934.	861.922	-72.0784	-7.71717
1968	883.	855.519	-27.4814	-3.11228
1969	803.	863.162	60.1619	7.49214
1970	854.	871.451	17.4514	2.04349
1971	903.	865.243	-37.7573	-4.18132
1972	849.	842.614	-6.38623	-0.752206
1973	818.	831.477	13.4773	1.64759
1974	902.	883.933	-18.0669	-2.00298
1975	834.	815.82	-18.1799	-2.17985
1976	776.	792.897	16.8972	2.17748
1977	822.	808.584	-13.4163	-1.63215
1978	774.	797.338	23.3376	3.0152
1979	814.	806.45	-7.55005	-0.927524

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

CHIASUT - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	848.895	852.204	3.31155	0.507942
RMS	850.019	852.861	30.823	3.58859
STD.DEV	44.9071	34.3506	31.4844	3.6498



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

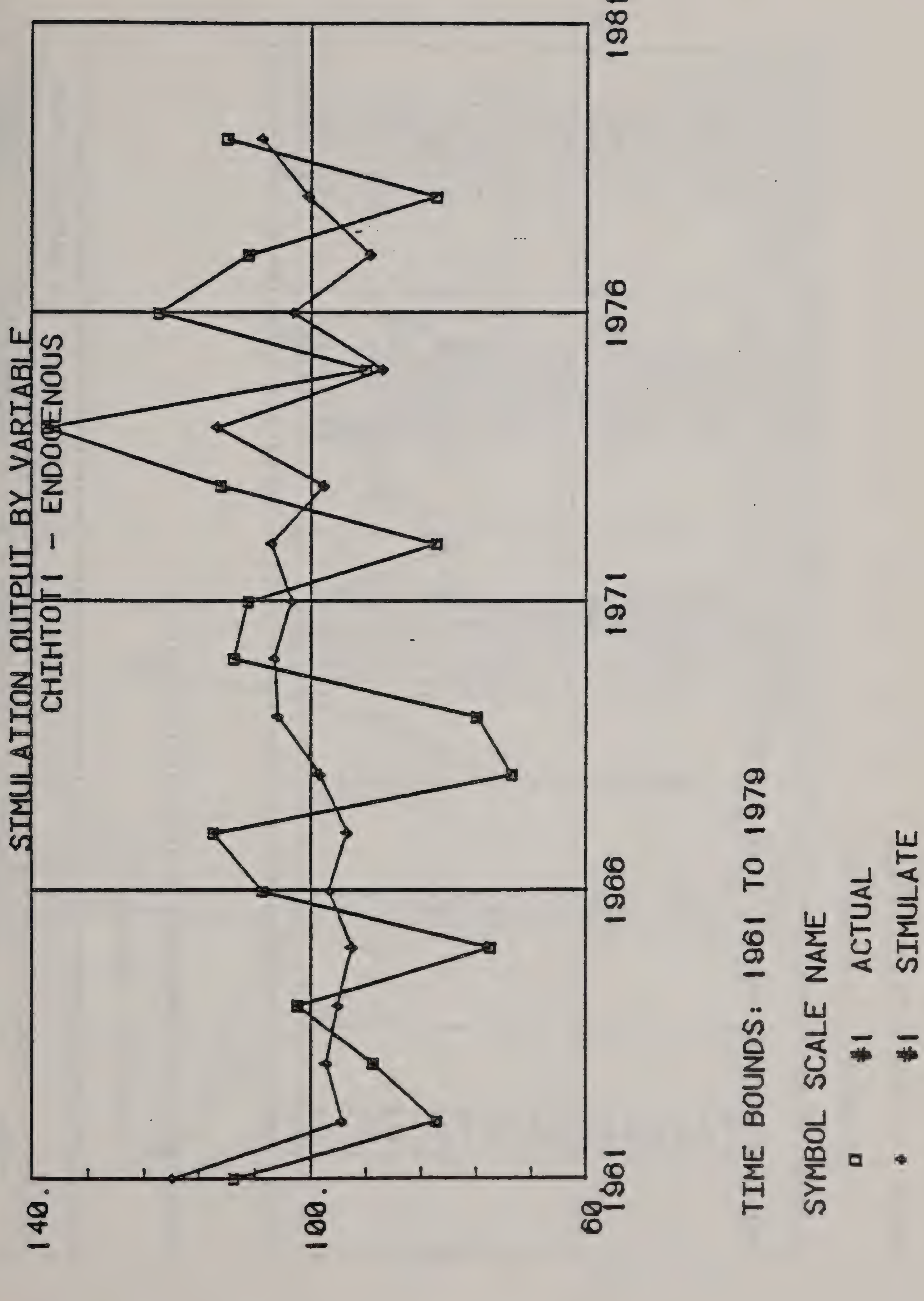
CHIASYO - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	4979.	4872.16	-106.836	-2.14573
1962	5046.	4885.43	-160.566	-3.18205
1963	5311.	5187.66	-123.336	-2.32227
1964	5488.	5453.76	-34.2422	-0.623946
1965	5909.	5744.39	-164.613	-2.78581
1966	6471.	6089.3	-381.695	-5.89855
1967	6608.	6454.95	-153.051	-2.31614
1968	6709.	6924.9	215.898	3.21804
1969	7201.	7374.14	173.145	2.40445
1970	7721.	7734.95	13.9492	0.180666
1971	7776.	8092.87	316.867	4.07494
1972	8187.	8248.91	61.9141	0.756248
1973	8054.	8221.16	167.16	2.07549
1974	8159.	8492.54	333.535	4.08794
1975	8164.	8875.69	711.691	8.71743
1976	9089.	9387.17	298.172	3.28058
1977	9451.	9663.48	212.484	2.24827
1978	10158.	10211.2	53.2031	0.523756
1979	11208.	10628.2	-579.805	-5.17313

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

CHIASYO - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	7457.31	7502.24	44.9408	0.374747
RMS	7649.65	7708.23	285.58	3.56623
STD.DEV	1751.32	1818.57	289.75	3.64367


SIMULATION OUTPUT BY VARIABLE
CHIHTOT1 - ENDOGENOUS
140.
100.
60
1961
1966
1971
1976
1981
TIME BOUNDS: 1961 TO 1979
SYMBOL SCALE NAME
#1 ACTUAL
#1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

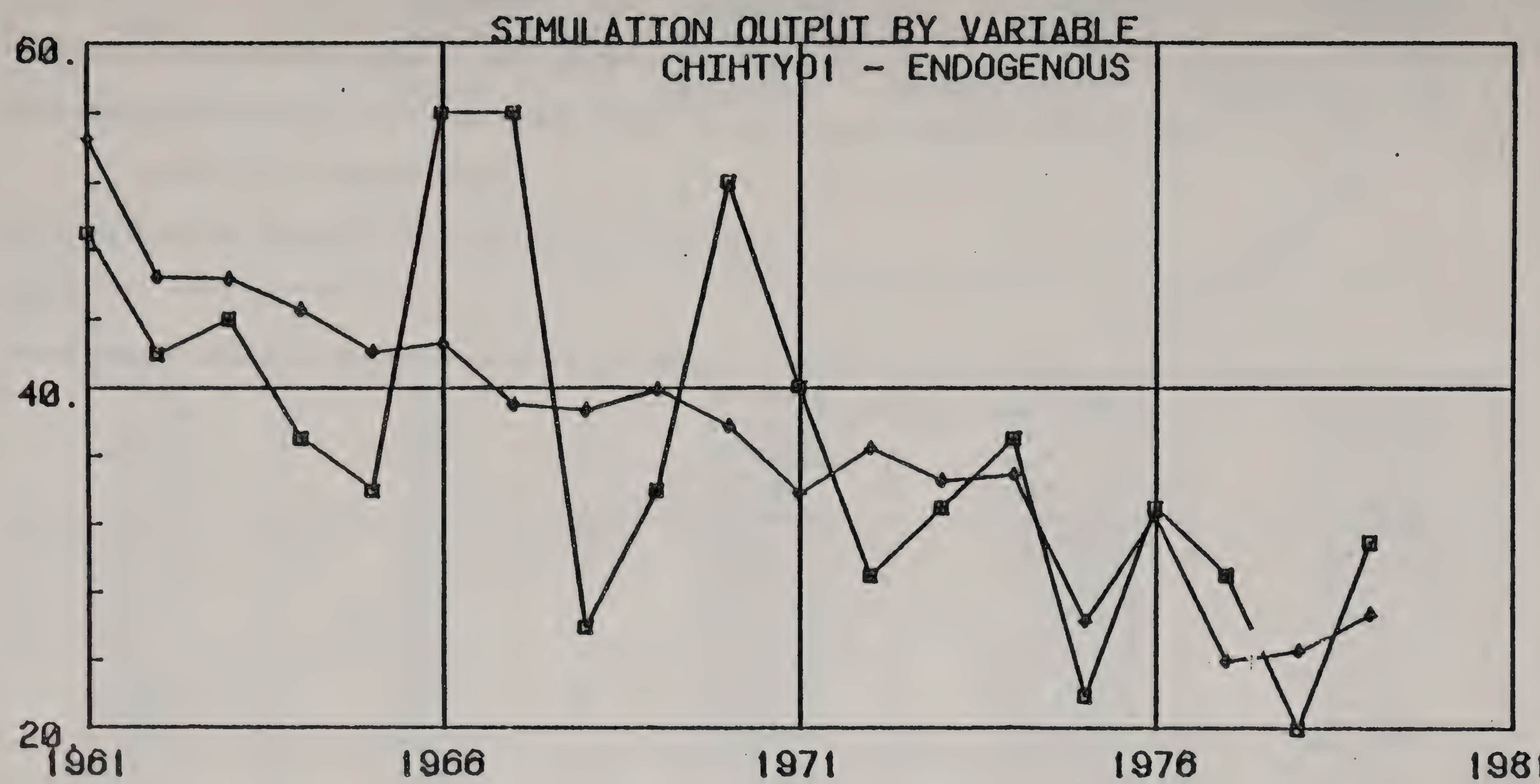
CHIHTUT1 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	111.	119.819	8.81882	7.94488
1962	82.	95.3892	13.3892	16.3282
1963	91.	97.7303	6.73029	7.39592
1964	102.	96.1348	-5.86523	-5.75023
1965	74.	94.0602	20.0602	27.1084
1966	107.	97.3452	-9.65483	-9.0232
1967	114.	94.546	-19.454	-17.0649
1968	71.	98.7382	27.7382	39.0679
1969	76.	104.764	28.764	37.8474
1970	111.	105.059	-5.94109	-5.35233
1971	109.	102.728	-6.272	-5.75413
1972	82.	105.48	23.48	28.6341
1973	113.	97.9995	-15.0005	-13.2748
1974	138.	113.407	-24.593	-17.821
1975	92.	89.6517	-2.34833	-2.55253
1976	122.	102.453	-19.5466	-16.0218
1977	109.	91.3296	-17.6704	-16.2114
1978	82.	100.388	18.3878	22.4241
1979	112.	107.041	-4.95854	-4.42727

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

CHIHTUT1 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	99.8947	100.74	0.845474	3.86828
RMS	101.49	101.002	16.7424	19.0672
STD.DEV	18.4146	7.47187	17.1793	19.1824



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

\+ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

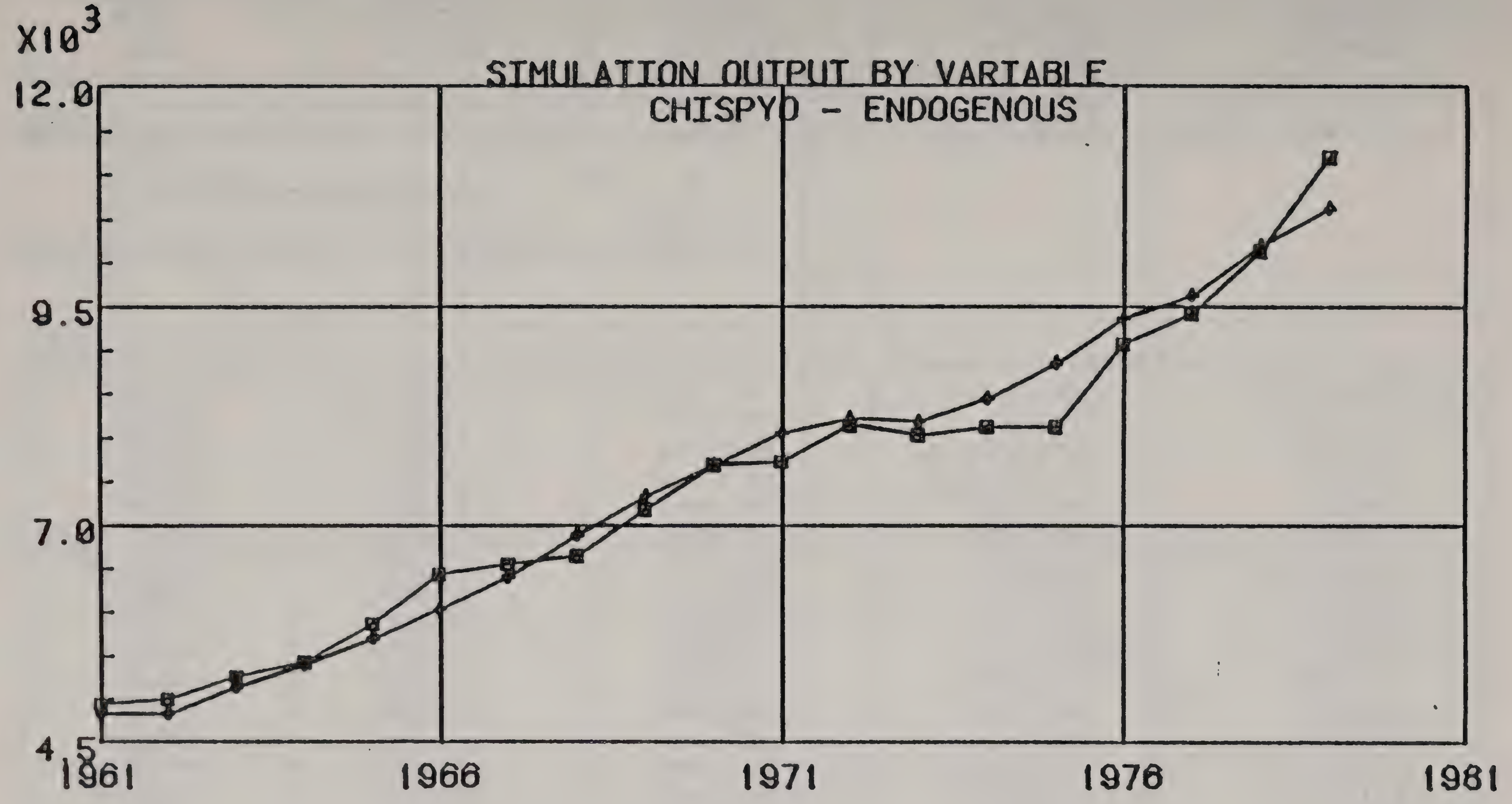
CHIHTYO1 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	49.	54.4616	5.46164	11.1462
1962	42.	46.4066	4.40665	10.492
1963	44.	46.3598	2.35976	5.36308
1964	37.	44.5041	7.5041	20.2814
1965	34.	42.078	8.07803	23.7589
1966	56.	42.5757	-13.4243	-23.9719
1967	56.	38.9495	-17.0505	-30.4473
1968	26.	38.6796	12.6796	48.7676
1969	34.	39.8521	5.85214	17.2122
1970	52.	37.7505	-14.2495	-27.4028
1971	40.	33.7802	-6.21979	-15.5495
1972	29.	36.3856	7.38562	25.4677
1973	33.	34.4605	1.46053	4.42583
1974	37.	34.8751	-2.12486	-5.74287
1975	22.	26.3009	4.30092	19.5496
1976	33.	32.525	-0.475037	-1.4395
1977	29.	24.0032	-4.99677	-17.2302
1978	20.	24.6029	4.60294	23.0147
1979	31.	26.6958	-4.30424	-13.8847

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

CHIHTYO1 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	37.0526	37.1182	0.065631	3.88476
RMS	38.4626	37.9555	8.04155	21.1667
STD.DEV	10.6012	8.14529	8.20163	21.3773



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

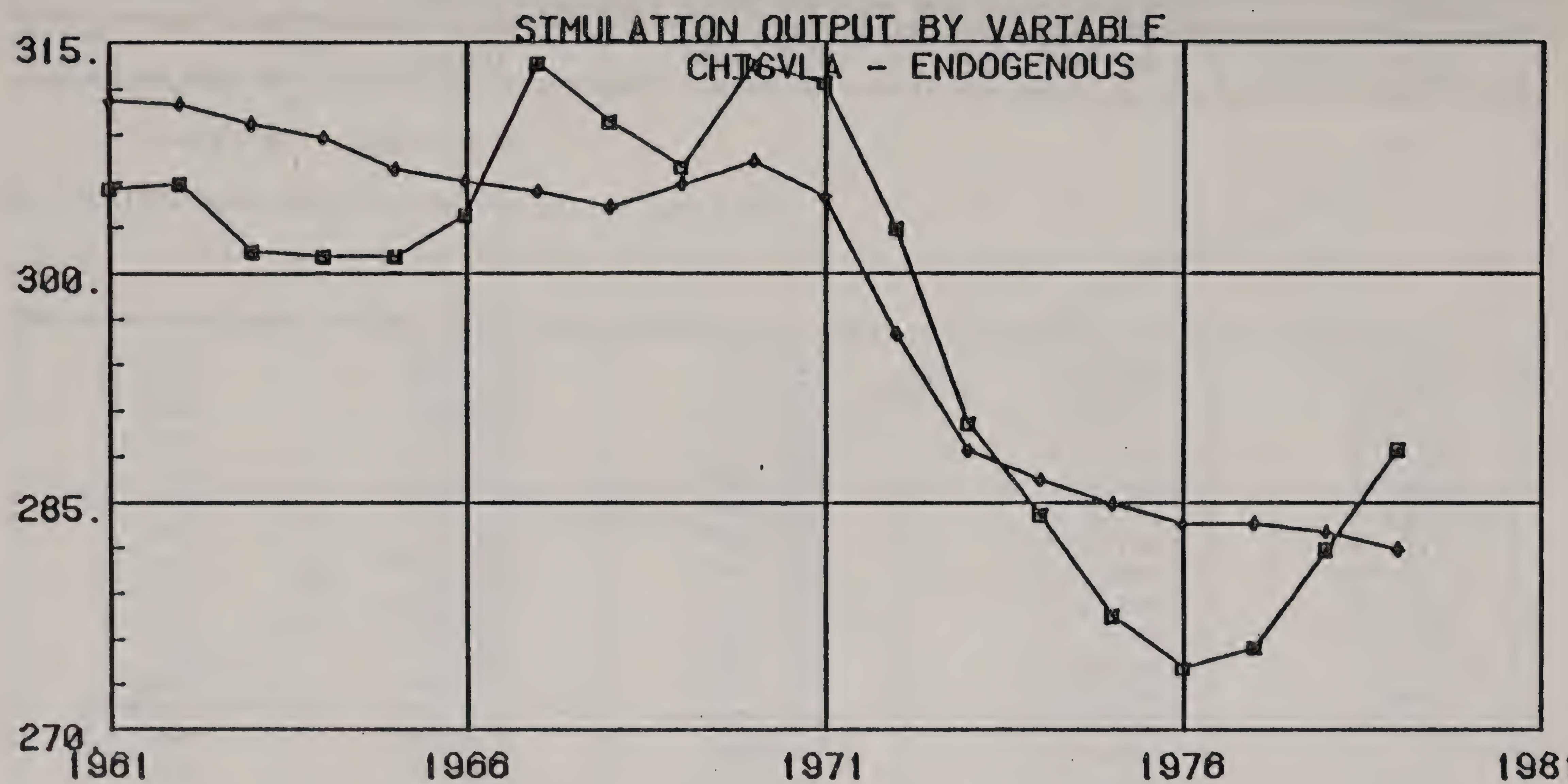
CHISPYO - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	4944.	4837.16	-106.836	-2.16092
1962	4997.	4830.97	-166.027	-3.32254
1963	5269.	5141.26	-127.742	-2.42441
1964	5444.	5407.4	-36.6016	-0.672328
1965	5872.	5699.88	-172.117	-2.93115
1966	6437.	6047.23	-389.77	-6.05514
1967	6552.	6412.37	-139.625	-2.13103
1968	6653.	6885.95	232.949	3.50142
1969	7175.	7335.47	160.469	2.2365
1970	7687.	7695.1	8.09766	0.105342
1971	7724.	8055.12	331.117	4.28686
1972	8147.	8215.14	68.1367	0.836341
1973	8025.	8184.78	159.777	1.99099
1974	8126.	8458.08	332.078	4.08661
1975	8127.	8840.82	713.816	8.78327
1976	9067.	9360.87	293.871	3.24111
1977	9418.	9630.96	212.961	2.26121
1978	10129.	10187.2	58.2031	0.574619
1979	11188.	10603.6	-584.406	-5.22351

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

CHISPYO - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	7420.05	7464.69	44.6501	0.36754
RMS	7614.66	7673.2	287.823	3.62178
STD.DEV	1757.44	1825.3	292.131	3.70182



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◇	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

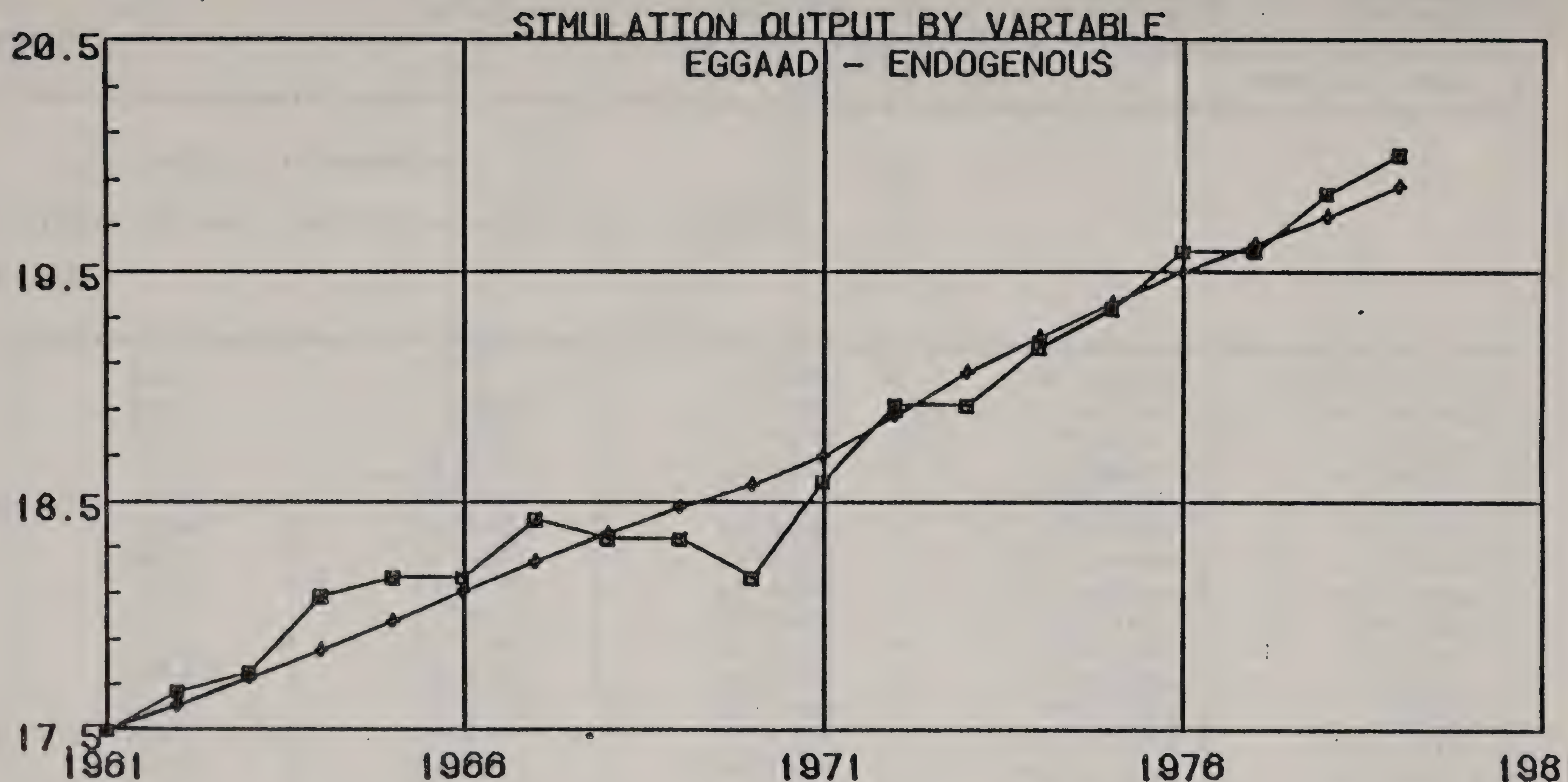
CHISVLA - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	305.546	311.207	5.66064	1.85263
1962	305.831	311.001	5.17041	1.69061
1963	301.461	309.771	8.31055	2.75676
1964	301.135	308.772	7.63672	2.53598
1965	301.053	306.746	5.69263	1.8909
1966	303.832	305.952	2.12036	0.697873
1967	313.717	305.297	-8.42041	-2.68408
1968	309.823	304.245	-5.57764	-1.80027
1969	306.885	305.777	-1.10767	-0.360938
1970	313.54	307.205	-6.33496	-2.02046
1971	312.333	304.936	-7.39746	-2.36845
1972	302.952	295.947	-7.00464	-2.31213
1973	290.141	288.31	-1.83105	-0.631091
1974	284.102	286.375	2.27319	0.800132
1975	277.55	284.774	7.22388	2.60273
1976	274.125	283.569	9.44385	3.44509
1977	275.479	283.573	8.09375	2.93806
1978	281.898	282.964	1.06616	0.378208
1979	288.424	281.825	-6.59888	-2.28791

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

CHISVLA - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	297.358	298.328	0.969444	0.374929
RMS	297.643	298.534	6.19975	2.09872
STD.DEV	13.3627	11.3861	6.29129	2.12154



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

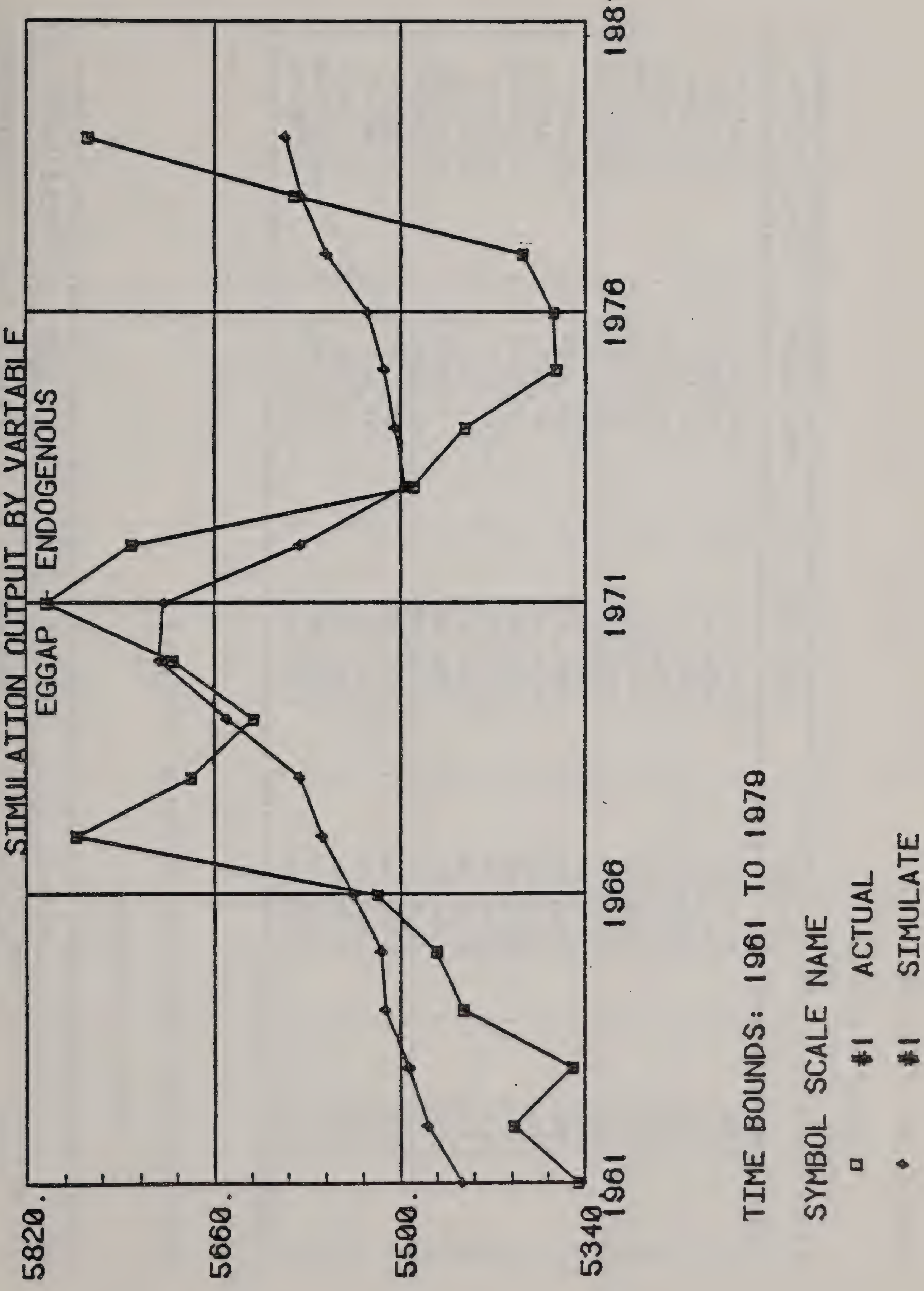
EGGAAD - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	17.5	17.5046	0.004562	0.026071
1962	17.6667	17.6103	-0.056366	-0.319053
1963	17.75	17.7296	-0.020432	-0.115107
1964	18.0833	17.8529	-0.230469	-1.27448
1965	18.1667	17.9841	-0.18251	-1.00464
1966	18.1667	18.111	-0.055649	-0.306324
1967	18.4167	18.2352	-0.181427	-0.985124
1968	18.3333	18.3608	0.027512	0.150063
1969	18.3333	18.471	0.137665	0.750899
1970	18.1667	18.5756	0.40892	2.25094
1971	18.5833	18.7008	0.117493	0.632248
1972	18.9167	18.8761	-0.040604	-0.214645
1973	18.9167	19.0631	0.146408	0.773964
1974	19.1667	19.2195	0.052811	0.275534
1975	19.3333	19.3615	0.028137	0.145537
1976	19.5833	19.4952	-0.08815	-0.450128
1977	19.5833	19.6181	0.03476	0.177495
1978	19.8333	19.7404	-0.092911	-0.468457
1979	20.	19.8658	-0.134171	-0.670852

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

EGGAAD - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	18.6579	18.6513	-0.006548	-0.032951
RMS	18.6723	18.6658	0.143097	0.778401
STD.DEV	0.753538	0.755582	0.146864	0.799015


SIMULATION OUTPUT BY VARIABLE
EGGAP - ENDOGENOUS
5820.
5660.
5500.
5340
1961
1966
1971
1976
1981
TIME BOUNDS: 1961 TO 1979
SYMBOL SCALE NAME
□ #1 ACTUAL
◊ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

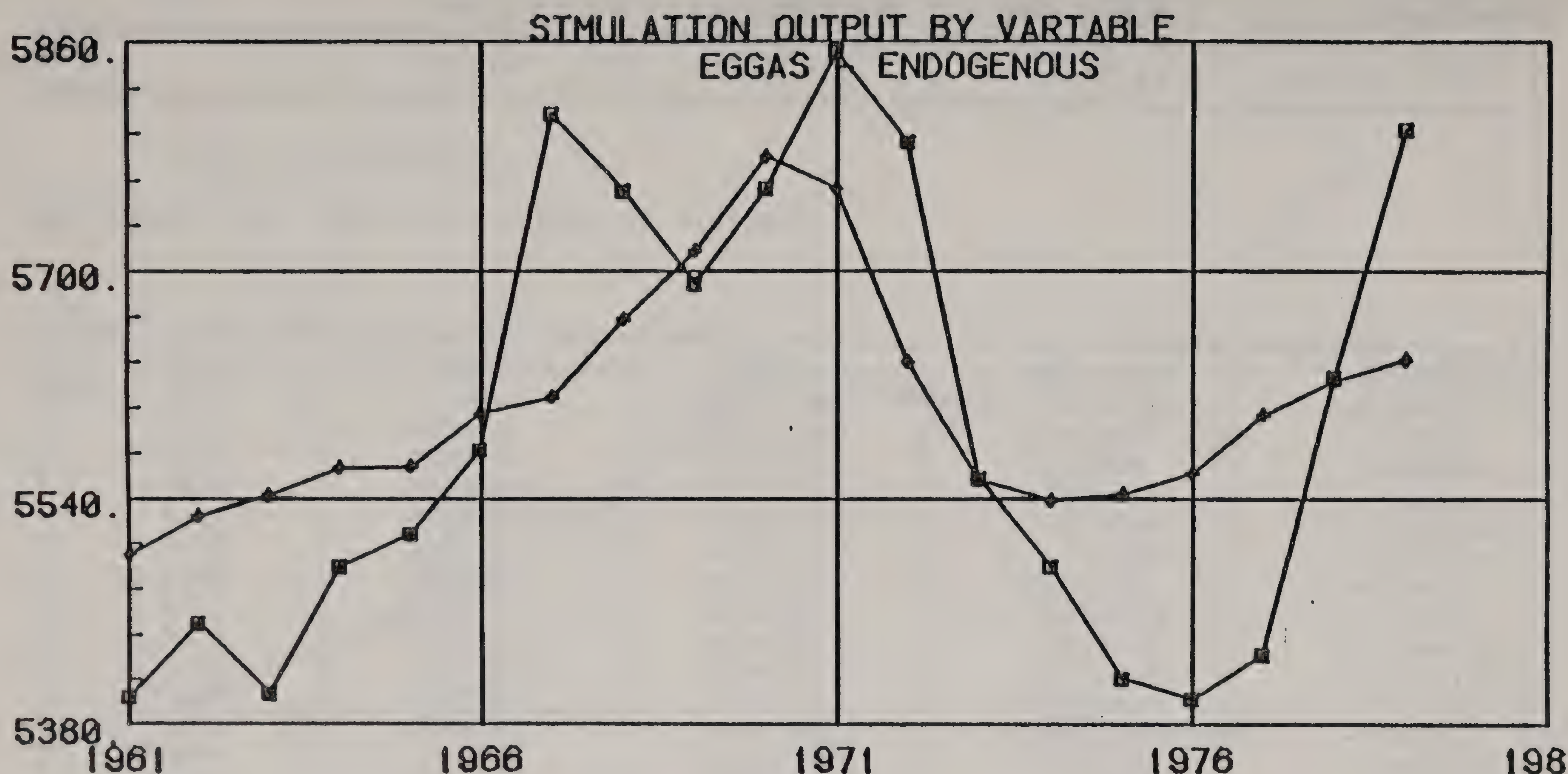
EGGAP - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	5347.05	5447.53	100.48	1.87918
1962	5403.01	5476.82	73.8125	1.36614
1963	5350.93	5492.11	141.184	2.63849
1964	5445.52	5512.46	66.9375	1.22922
1965	5469.12	5516.55	47.4336	0.867298
1966	5519.61	5541.11	21.4961	0.389449
1967	5777.62	5567.15	-210.469	-3.64283
1968	5680.08	5586.2	-93.8789	-1.65277
1969	5626.22	5648.01	21.7891	0.387277
1970	5695.97	5706.51	10.5391	0.185027
1971	5804.19	5702.54	-101.648	-1.75129
1972	5730.84	5586.31	-144.527	-2.52192
1973	5488.5	5496.07	7.57031	0.13793
1974	5445.29	5503.98	58.6875	1.07777
1975	5365.96	5513.64	147.676	2.75208
1976	5368.28	5528.22	159.941	2.97938
1977	5394.8	5563.15	168.352	3.12063
1978	5590.97	5585.83	-5.14062	-0.091945
1979	5768.48	5598.69	-169.793	-2.94346

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

EGGAP - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	5540.64	5556.46	15.8127	0.337138
RMS	5542.87	5556.89	111.373	2.00564
STD.DEV	161.15	71.4767	113.266	2.03128



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

+ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

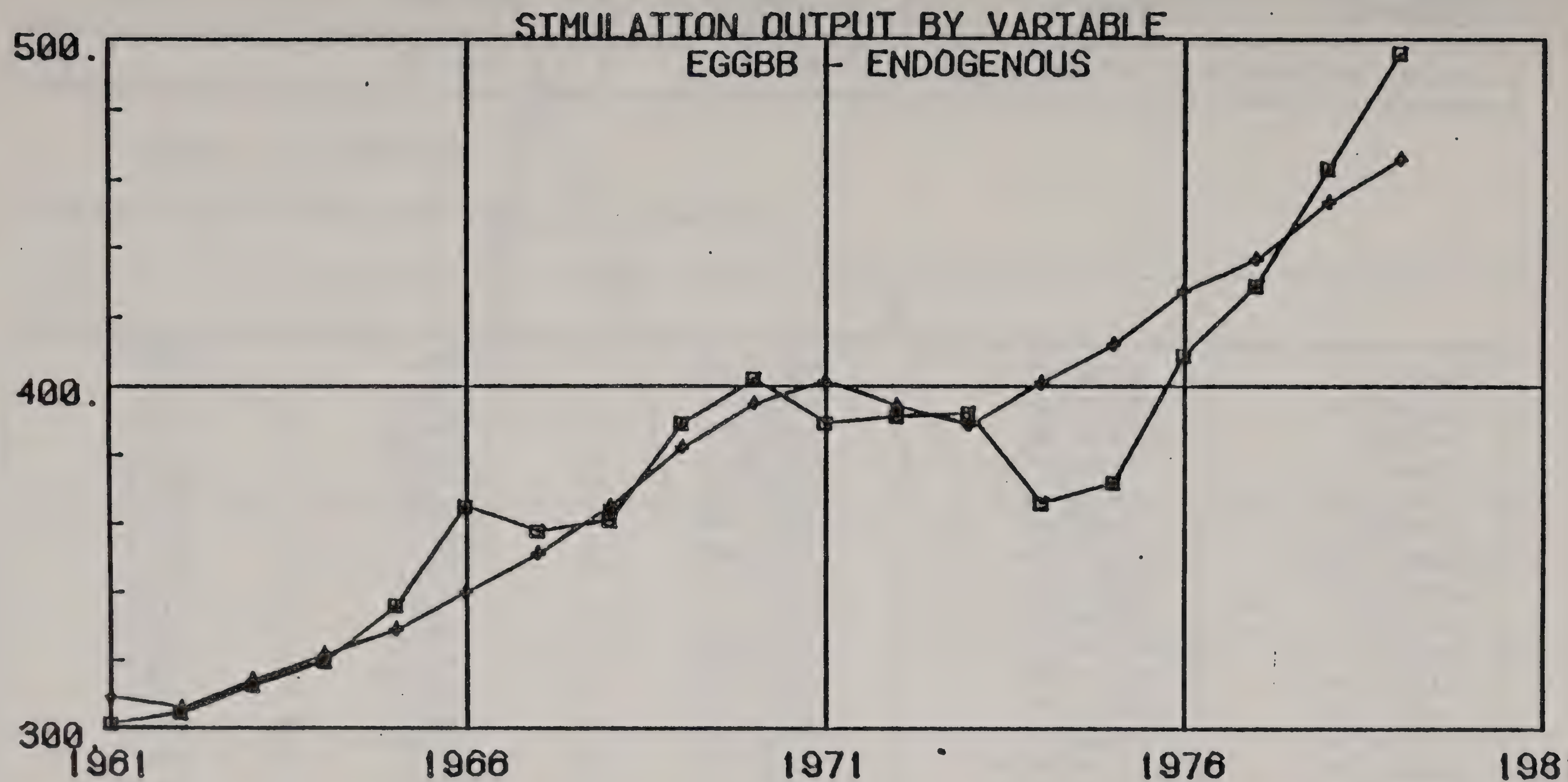
EGGAS - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	5400.05	5500.53	100.48	1.86073
1962	5452.01	5526.86	74.8516	1.37292
1963	5401.93	5542.04	140.105	2.59362
1964	5491.52	5560.99	69.4687	1.26502
1965	5515.12	5562.57	47.4531	0.860418
1966	5574.61	5599.75	25.1445	0.451054
1967	5809.62	5610.53	-199.094	-3.42697
1968	5756.08	5665.81	-90.2656	-1.56818
1969	5691.22	5714.28	23.0586	0.405161
1970	5756.97	5779.23	22.2617	0.386692
1971	5853.19	5757.8	-95.3945	-1.62979
1972	5789.84	5636.91	-152.926	-2.64128
1973	5554.5	5552.68	-1.82422	-0.032842
1974	5492.29	5537.75	45.4648	0.827794
1975	5412.96	5542.61	129.645	2.39508
1976	5399.28	5557.69	158.406	2.93384
1977	5429.8	5599.38	169.582	3.12317
1978	5625.97	5623.54	-2.43359	-0.043256
1979	5798.48	5638.11	-160.367	-2.76568

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

EGGAS - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	5589.75	5605.73	15.9799	0.335132
RMS	5592.	5606.25	108.286	1.93585
STD.DEV	162.98	78.1709	110.035	1.95886



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

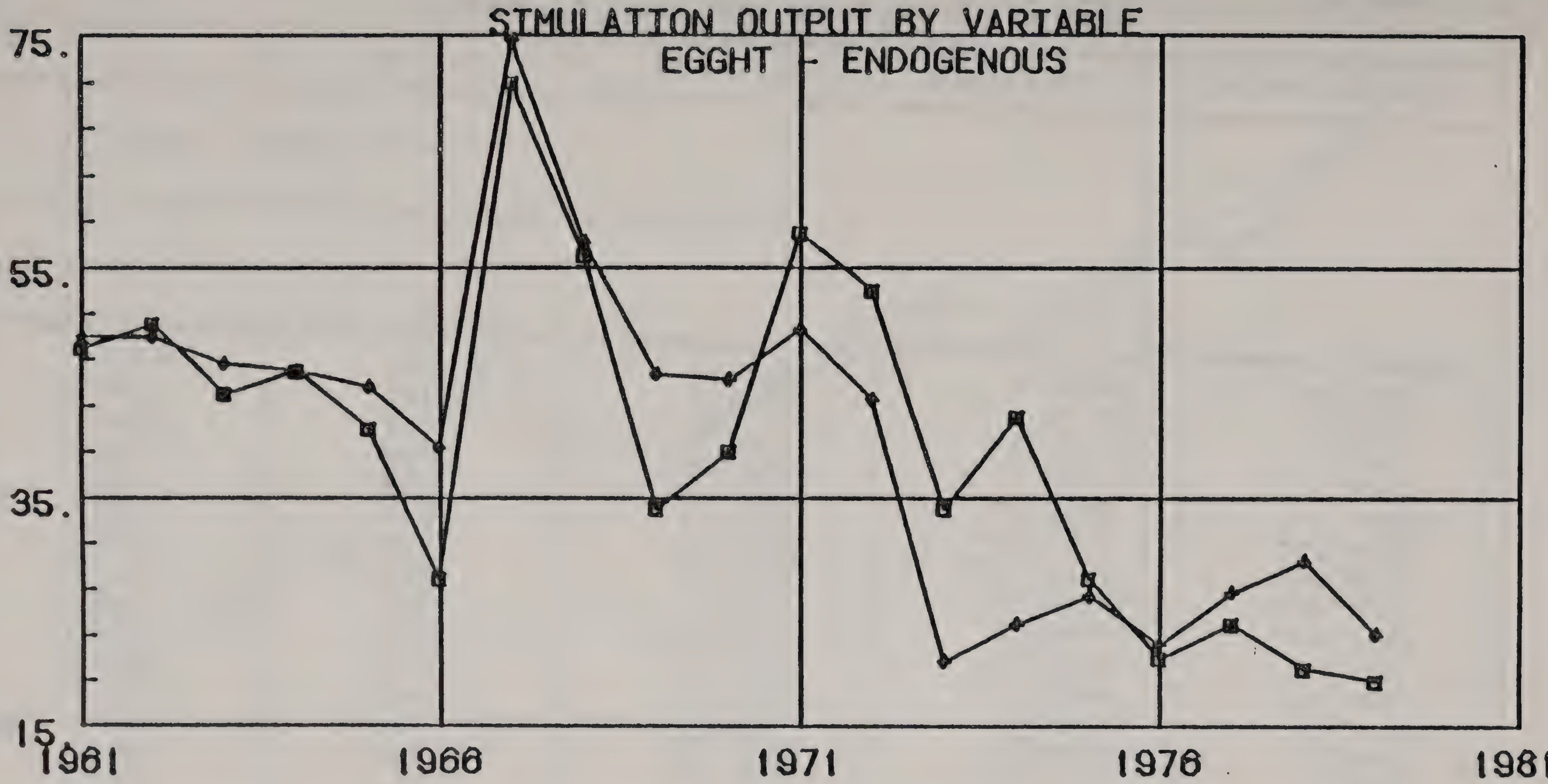
EGGBB - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	302.	309.239	7.23901	2.39702
1962	305.	306.159	1.15942	0.380139
1963	313.	314.183	1.18286	0.377911
1964	320.	321.983	1.98291	0.619659
1965	336.	328.862	-7.1377	-2.12431
1966	365.	340.155	-24.845	-6.80684
1967	358.	351.241	-6.75903	-1.888
1968	361.	365.018	4.01758	1.1129
1969	389.	382.291	-6.70923	-1.72474
1970	402.	394.541	-7.45874	-1.85541
1971	389.	401.249	12.2488	3.14879
1972	391.	394.359	3.35938	0.859175
1973	392.	388.871	-3.12915	-0.798253
1974	366.	400.537	34.5371	9.43636
1975	372.	411.636	39.6365	10.655
1976	409.	427.385	18.3848	4.49505
1977	429.	436.819	7.81934	1.82269
1978	463.	453.343	-9.65723	-2.08579
1979	496.	465.154	-30.8459	-6.21894

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

EGGBB - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	376.737	378.579	1.84345	0.621177
RMS	380.031	381.616	16.6522	4.28522
STD.DEV	51.2941	49.3588	17.0033	4.35614



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

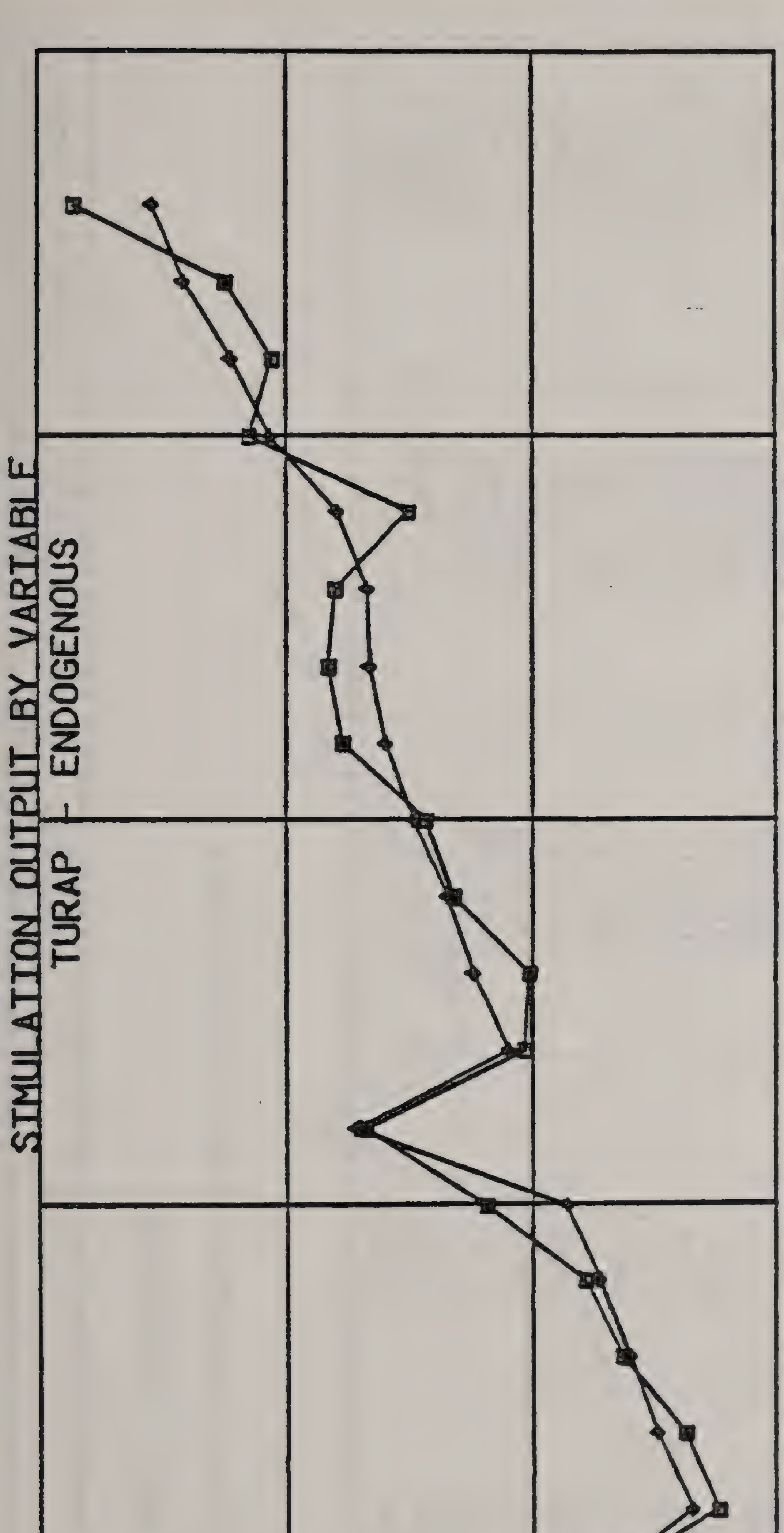
EGGHT - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	48.	49.0401	1.04007	2.16681
1962	50.	48.9235	-1.07648	-2.15295
1963	44.	46.5349	2.53488	5.76109
1964	46.	46.0196	0.019577	0.042559
1965	41.	44.651	3.65102	8.90492
1966	28.	39.3762	11.3762	40.6293
1967	71.	74.6139	3.61394	5.09005
1968	56.	57.2701	1.27011	2.26805
1969	34.	45.7249	11.7249	34.485
1970	39.	45.2548	6.25481	16.038
1971	58.	49.6041	-8.39589	-14.4757
1972	53.	43.6079	-9.39212	-17.721
1973	34.	20.7796	-13.2204	-38.8834
1974	42.	23.9715	-18.0285	-42.9251
1975	28.	26.4659	-1.5341	-5.47894
1976	21.	22.2327	1.23274	5.8702
1977	24.	26.7104	2.71037	11.2932
1978	20.	29.4294	9.42935	47.1467
1979	19.	23.1563	4.15627	21.8751

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

EGGHT - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	39.7895	40.1771	0.387723	4.20705
RMS	42.1963	42.4827	7.67291	22.9661
STD.DEV	14.4321	14.1833	7.8731	23.1962



TIME BOUNDS: 1961 TO 1979

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

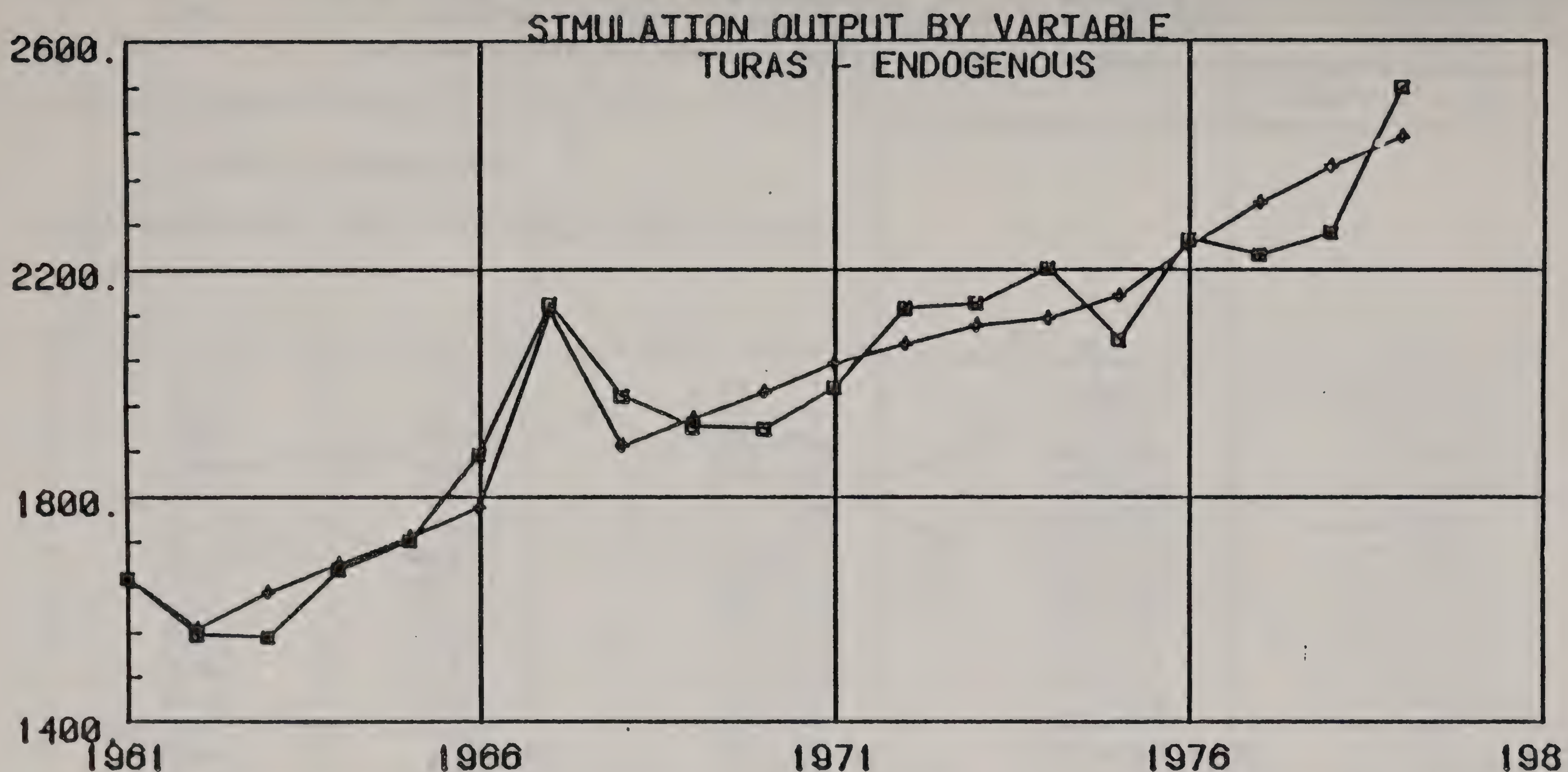
TURAP - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	1495.	1495.	-0.003418	-0.000229
1962	1294.	1337.26	43.2615	3.34324
1963	1351.	1396.65	45.6492	3.37892
1964	1453.	1440.32	-12.6777	-0.872521
1965	1515.	1489.28	-25.718	-1.69756
1966	1674.	1545.12	-128.883	-7.6991
1967	1870.	1886.55	16.5459	0.884807
1968	1611.	1636.59	25.5947	1.58875
1969	1606.	1695.16	89.1602	5.55169
1970	1729.	1737.11	8.1062	0.468837
1971	1772.	1793.3	21.2954	1.20177
1972	1909.	1837.64	-71.3613	-3.73815
1973	1933.	1864.2	-68.7954	-3.559
1974	1921.	1868.4	-52.603	-2.73831
1975	1803.	1916.68	113.684	6.30527
1976	2059.	2026.95	-32.0486	-1.55651
1977	2023.	2088.38	65.3752	3.2316
1978	2098.	2166.5	68.5032	3.26517
1979	2345.	2215.38	-129.616	-5.52732

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

TURAP - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	1761.11	1759.81	-1.29109	0.096386
RMS	1781.46	1776.33	66.1323	3.62215
STD.DEV	275.919	262.952	67.9315	3.72009



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◆	#1	SIMULATE

SIMULATION OUTPUT BY VARIABLE

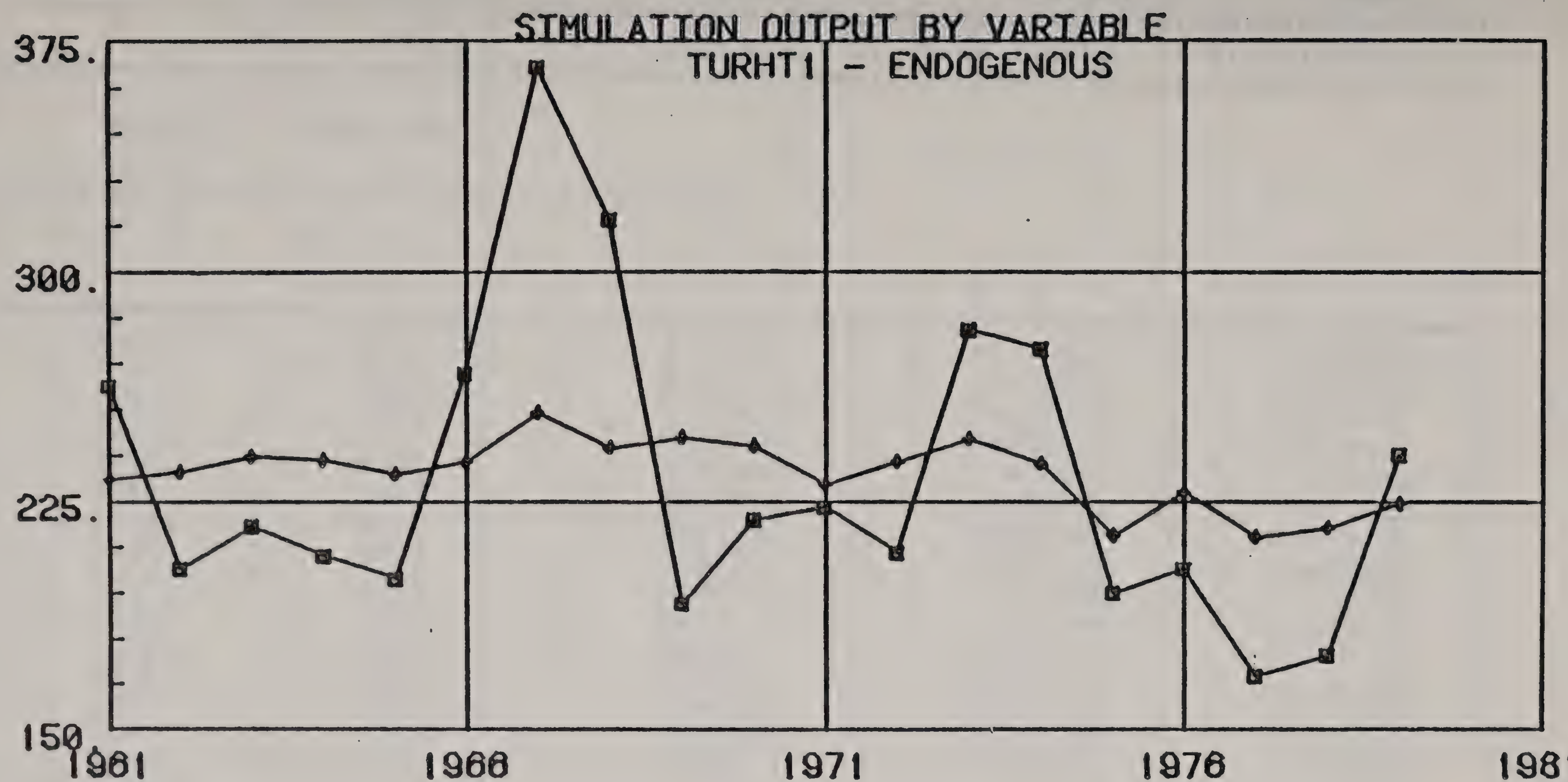
TURAS - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	1655.	1655.	-0.003418	-0.000207
1962	1557.	1569.42	12.4236	0.797918
1963	1554.	1631.14	77.1436	4.96419
1964	1670.	1679.96	9.95947	0.596375
1965	1722.	1727.59	5.59082	0.32467
1966	1874.	1779.13	-94.8723	-5.06256
1967	2137.	2124.56	-12.4375	-0.582007
1968	1978.	1890.05	-87.9482	-[illegible].44632
1969	1923.	1937.53	14.5269	0.755427
1970	1921.	1983.01	62.0061	3.2278
1971	1991.	2036.05	45.0518	2.26277
1972	2132.	2068.26	-63.7427	-2.98981
1973	2141.	2101.73	-39.2742	-1.83438
1974	2202.	2113.29	-88.7122	-4.02871
1975	2078.	2153.87	75.8662	3.65092
1976	2254.	2240.93	-13.0735	-0.580012
1977	2226.	2316.52	90.5249	4.06671
1978	2266.	2379.84	113.836	5.02366
1979	2520.	2431.46	-88.5383	-3.51342

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

TURAS - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	1989.53	1990.49	0.964587	0.13858
RMS	2006.47	2006.78	63.9103	3.11117
STD.DEV	267.354	262.198	65.6542	3.19325



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

TURHT1 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	263.	232.162	-30.8377	-11.7253
1962	203.	234.495	31.4946	15.5146
1963	217.	239.637	22.6374	10.432
1964	207.	238.309	31.3088	15.125
1965	200.	234.011	34.0108	17.0054
1966	267.	238.017	-28.9832	-10.8551
1967	367.	253.457	-113.543	-30.9381
1968	317.	242.367	-74.6333	-23.5436
1969	192.	245.9	53.9	28.0729
1970	219.	242.756	23.7564	10.8477
1971	223.	230.619	7.61885	3.41652
1972	208.	237.521	29.5212	14.1929
1973	281.	244.891	-36.1091	-12.8502
1974	275.	237.182	-37.8177	-13.7519
1975	195.	213.975	18.9753	9.73091
1976	203.	228.15	25.1497	12.389
1977	168.	213.333	45.3332	26.984
1978	175.	216.077	41.0774	23.4728
1979	240.	223.995	-16.0051	-6.66879

STATISTICS FOR SIMULATION OUTPUT BY VARIABLE

TURHT1 - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	232.632	234.045	1.41341	4.04477
RMS	237.849	234.289	43.5399	17.2887
STD.DEV	50.9021	10.9878	44.7094	17.2696

II.5 Input Derived Demand Functions for Feed Grains and Oilseed Meals in U.S. Livestock Production

The input derived demand component consists of the demand functions for feed grain, hay and oilseed meals. The general structure of these equations reflects the theoretical framework of derived input demand functions. As such they depend on their own prices, prices of alternative feed grains and high protein feeds, prices of the final livestock products and the number of units of the pertinent consuming animals.

For given prices of livestock products, coarse grains and high protein feeds, the input derived demand functions are assumed to be recursive to the livestock supply system. Therefore, the number of units of pertinent consuming animals taken as explanatory variables in these demand functions are obtained from the simultaneous solutions of the livestock supply system.

As far as the feed grains are concerned, the following crops are considered: corn, sorghum, barley, oats and wheat. Because of the geographical dependency of feeding practices and livestock production, the nature of the grain consuming animal units may be different from one feed-grain to another. Therefore, while the feed demands of barley and corn depend on a general measure of grain consuming animal units which includes all livestock production, the feed demands of sorghum and wheat depends only on fed beef production and the feed demand of oats depends on the number of milking cows on hand.

The above mentioned geographical dependency of feeding practices affects also the available feed-grain alternatives for each of the feed grains considered. This is reflected by the different feed grain prices in each of the estimated feed grain demand functions.

Unlike the input demand for the feed grains, the demand for hay and roughage depends on livestock production and does not depend on livestock animal numbers. Of all feed grains considered as possible substitutes, sorghum seems to be the most significant one.

As far as high protein feeds are concerned, only the oilseed meals are considered. Soybean meal represents about 90% of all oilseed meals fed to U.S. livestock. The rest is mainly composed of cotton-seed meal. For this reason, just the demand for soybean meal and the demand of all other oilseed meals will be presently estimated.

The demand for soybean oil depends on and index of livestock production, on its own price relative to livestock prices and on the cottonseed meal price relative to livestock prices. This last price relative is a reflection of the substitution effects among the oilseed meals.

The demand for other oilseed meals (excluding soybean meal) depend on the relative price of cotton-seed meal as a representative price of these meals, on the relative price of soybean meal and on the amount fed of soybean meal. This specification does reflect the residual demand characteristic of nonsoybean meal.

Following the general description of the estimated equations, the solutions of these input demand functions solved simultaneously with the livestock supply system are validated for the historical period. The statistical properties of the estimated equations and the relevant data are presented in the Appendix to section II.

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SYMBOL DECLARATIONS

ENDOGENOUS:
   BARUF    - BARLEY, UTILIZED FOR FEED, JUL-JE, US, MIL BU
   CORUF    - CORN, UTILIZED FOR FEED, OCT-SEP, US, MIL BU
   GCAU     - GRAIN CONSUMING ANIMAL UNITS, CAL YR, ANIMAL UNITS
   LIVJF    - LIVESTOCK PRODUCTION INDEX
   OATUF    - OATS, UTILIZED FOR FEED, JUL-JE, US, MIL BU
   OILMEALD - OILMEAL, 1,000 TONS
   RAUFED   - DISAPPEARANCE FOR HAY, MIL TONS
   SORUF    - SORGHUM, UTILIZED FOR FEED, OCT-SEP, US, MIL BU
   SOYBEANM - SOYBEAN MEAL, 1,000 TONS
   WHEUF    - WHEAT, UTILIZED FOR FEED, JUL-JE, US, MIL BU

DEFINITION:
   LIVIF    - LIVESTOCK PRICE INDEX (1953-57 FARM PRICES), 1967=1.0

EXOGENOUS:
   BAGPM7C  - BARROWS AND GILTS, PRICE, SEVEN MARKETS, $/CWT
   BARPF    - BARLEY, AVERAGE PRICE RECEIVED BY FARMERS, JUL-JE, US, $/BU
   CATPFFD  - CATTLE, PRICE, SLAUGHTER STEERS, OMAHA, ALL WTS. AND GRADES
              $/CWT
   CATPFNF  - CATTLE, UTILITY COW PRICE, OMAHA, $/CWT
   CHIPWBR9 - BROILERS, 9-CITY WHOLESALE PRICE, RTC, CENTS/LB
   CHIPWXB  - CHICKENS, NONBROILER, WHOLESALE PRICE, US, CENTS/LB
   CORPF    - CORN, AVERAGE PRICE RECEIVED BY FARMERS, OCT-SEP, US, $/BU
   COTMEALP - COTTON MEAL PRICE, $/TON
   DUM6467  - DUMMY VARIABLE, 1964=1 AND 1967=1, OTHERS=0
   DUM7374  - DUMMY VARIABLE, 1973=1 AND 1974=1, OTHERS=0
   E_BEEAPFD - TOTAL PROD FED BEEF, MIL LBS
   E_BEEAPNF - TOTAL PROD NON-FED BEEF, MIL LBS
   E_CHIAPOT - CHICKENS, OTHER, PRODUCTION, RTC, US, MIL LBS
   E_CHISPYO - CHICKENS, YOUNG, PRODUCTION, RTC, US, MIL LBS
   E_CHISVLA - CHICKENS, LAYERS, NUMBER ON FARMS, US, MIL HEAD
   E_COWBEMC - COWS, DAIRY, ADDITIONS TO HERD, US, MIL HEAD
   E_COWSNBE - COWS, BEEF, NUMBER ON FARMS, JAN 1, US, MIL HEAD
   E_COWSNMC - COWS, DAIRY, NUMBER ON FARMS, JAN 1, US, MIL HEAD
   E_EGGAP  - EGGS PRODUCTION, US, MIL DOZ
   E_HEISBBE - HEIFERS, BEEF, NUMBER FOR BREEDING, US, MIL HEAD
   E_HOGSM  - HOGS, MARKET, NUMBER ON FARMS, US, MIL HEAD
   E_HOGSNBR - HOGS, BREEDING, NUMBER ON FARMS, DEC 1, US, MIL HEAD
   E_MILAP  - MILK, TOTAL PRODUCTION, US, BIL LBS
   E_PIGSC  - PIGS, CROP, US, MIL HEAD
   E_PORAP77 - PORK, PRODUCTION, CARCASS WT., US, MIL LBS
   E_SAHKSFD - STEER AND HEIFER FED SLAUGHTER AND FARM SLAUGHTER, MIL HEAD
   E_TURAP  - TURKEY, PRODUCTION, RTC, US, MIL LBS
   EGGPF    - EGGS, AVERAGE PRICE RECEIVED BY FARMERS, US, CENTS/DOZ
   MILPF    - MILK, ALL SOLD TO PLANTS, AVE WHOLESALE PRICE RECEIVED BY
              FARMERS, US, $/CWT
   OATPF    - OATS, AVERAGE PRICE RECEIVED BY FARMERS, JUL-JE, US, $/BU
   RAPHIPF  - PRICE RECEIVED BY FARMERS FOR HAY, $/TON
   SOMPF    - SOYBEAN MEAL PRICE, US (C.Y.), CENTS/LB
   SORPF    - SORGHUM, FARM PRICE, OCT YR, $/BU
   TURPF    - TURKEYS, LIVEWEIGHT, AVERAGE PRICE RECEIVED BY FARMERS, US,
              CENTS/LB
   WHEPF    - WHEAT, AVERAGE PRICE RECEIVED BY FARMERS, JUL-JE, US, $/BU
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EQUATIONS

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  LIVESTOCK PRICE INDEX:
 1:      LIVIF = (1.16456*BAGPM7C+1.2959*CATPFFD+0.5657*CATPFNF+0.6032*CHIPHBR9+0.0761*CHIPHXB+0.5319*EGGPF+
         0.1722*TURPF)/100

  LIVESTOCK PRODUCTION INDEX:
 2:      LIVJF = (0.01487*E_BEEAPFD+0.0103*E_BEEAPNF+0.01148*E_PORAP77+0.01504*E_CHISPYO+0.00472*E_CHIAPOT+
         0.01871*E_EGGAP+0.01166*E_TURAP+3.00124*E_MILAP)/1000

  GRAIN CONSUMING ANIMAL UNITS:
 3:      GCAU = 0.2285*(E_HOGSNBR(-1)+E_HOGSM(-1)+E_PIGSC)+1.0475*(E_COWSNMC+E_COWSEMC/0.6)+1.5323*1.5*
         E_SAHKSFD+0.0547*(E_COWSNBE+E_HEISBBE)+0.0217*E_CHISVLA+0.002*E_CHISPYO/2.7+0.0054*E_CHIAPOT/2.7+
         0.0015*E_TURAP/14.4

  FEED GRAIN DEMAND FOR BARLEY:
 4:      BARDF = 180.411-302.896*BARPF/LIVIF+173.91*SORPF/LIVIF-6.30054*SOMPF/LIVIF+86.6037*CORPF/LIVIF+0.76407
         *GCAU

  FEED GRAIN DEMAND FOR CORN:
 5:      CORDF = 1016.38-2347.43*CORPF/LIVIF+113.441*SOMPF/LIVIF+32.7664*GCAU+967.727*BARPF/LIVIF+510.141*
         DUM7374

  FEED GRAIN DEMAND FOR SORGHUM:
 6:      SORDF = 421.834-30040.2*SORPF/CATPFFD+22081.7*CORPF/CATPFFD+0.0306*E_BEEAPFD-383.652*SOMPF/CATPFFD

  FEED GRAIN DEMAND FOR WHEAT:
 7:      WHEDF = 158.359-3365.19*WHEPF/CATPFFD-8471.6*SORPF/CATPFFD+0.0107*E_BEEAPFD-47.6136*DUM6467+8228.26*
         CORPF/CATPFFD

  FEED GRAIN DEMAND FOR OAT:
 8:      OATDF = -48.3602-3454.29*OATPF/MILPF+1457.12*CORPF/MILPF+46.6862*(E_COWSNMC+E_COWSEMC/0.6)

  FEED GRAIN DEMAND FOR RAPHAGE AND HAY:
 9:      RADFED = 33.4355+92.5984*LIVJF-0.63952*RAPHIPF/LIVIF+11.9801*SORPF/LIVIF

  SOYBEAN MEAL:
10:      SOYBEANM = -31013.9+42903.3*LIVJF+31.1354*COTMEALP/LIVIF-788.058*SOMPF/LIVIF

  NON SOYBEAN MEAL (= TOTAL OIL SEED MEAL - SOYBEAN MEAL):
11:      OILMEALD = 4226.86+152.64*SOMPF/LIVIF-11.8985*COTMEALP/LIVIF-0.12284*SOYBEANM
```
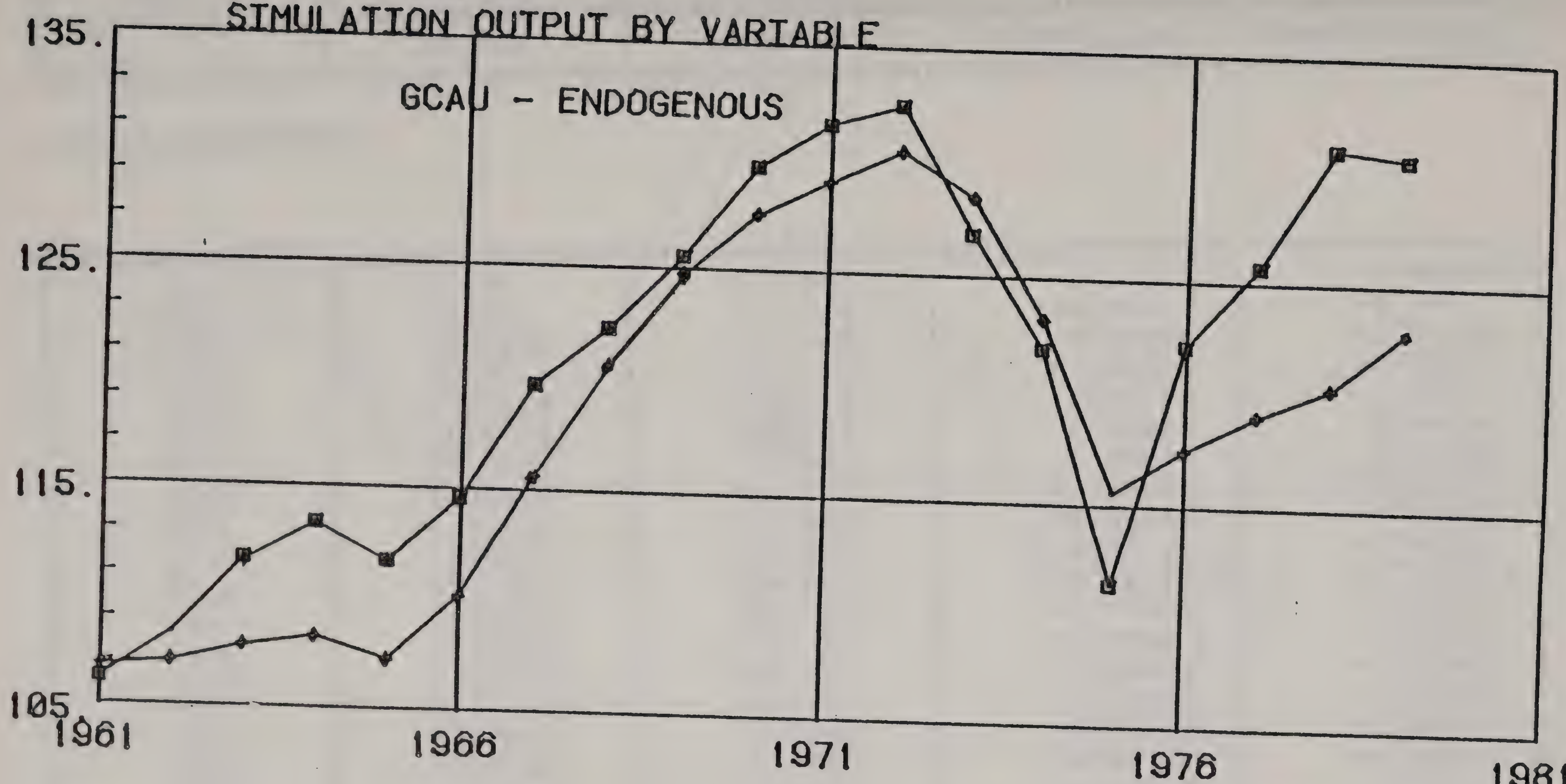



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

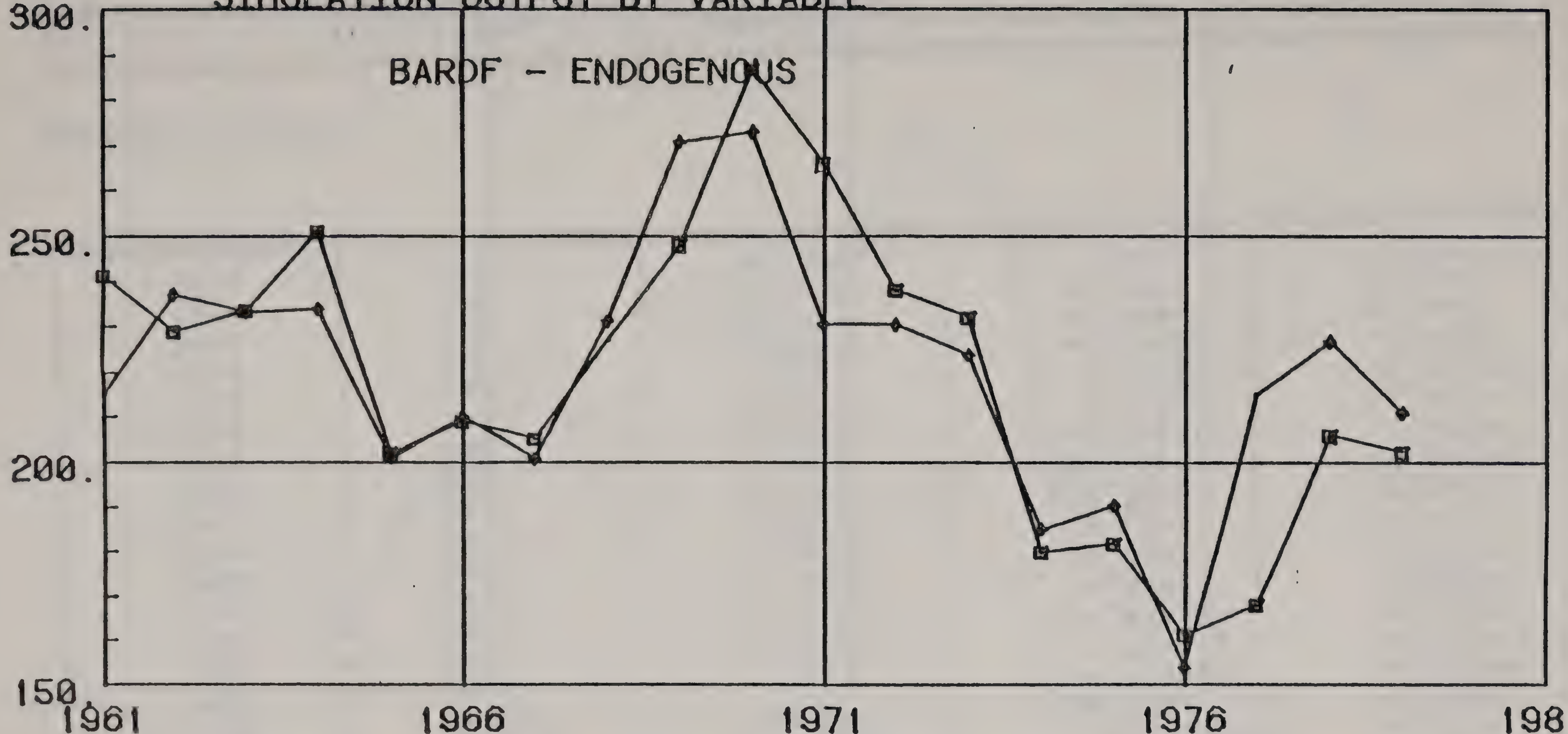
GCAU = ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	106.247	106.744	0.496964	0.467743
1962	108.309	107.017	-1.29192	-1.19281
1963	111.735	107.737	-3.99776	-3.57789
1964	113.406	108.199	-5.20731	-4.59174
1965	111.682	107.25	-4.43169	-3.96813
1966	114.572	110.089	-4.48299	-3.91281
1967	119.768	115.603	-4.1649	-3.47747
1968	122.345	120.681	-1.66403	-1.36011
1969	125.533	124.728	-0.805038	-0.641296
1970	129.562	127.435	-2.1273	-1.64192
1971	131.545	128.951	-2.5937	-1.97172
1972	132.493	130.383	-2.10951	-1.59217
1973	126.842	128.463	1.62082	1.27782
1974	121.878	123.107	1.2285	1.00797
1975	111.394	115.577	4.1833	3.75541
1976	122.127	117.453	-4.67415	-3.82728
1977	125.737	119.082	-6.65503	-5.29282
1978	130.97	120.364	-10.606	-8.098
1979	130.6	122.807	-7.79292	-5.96702

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	120.881	117.983	-2.89866	-2.34758
RMS	121.171	118.254	4.4851	3.63211
STD.DEV	8.60558	8.22908	3.51634	2.84741

SIMULATION OUTPUT BY VARIABLE



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

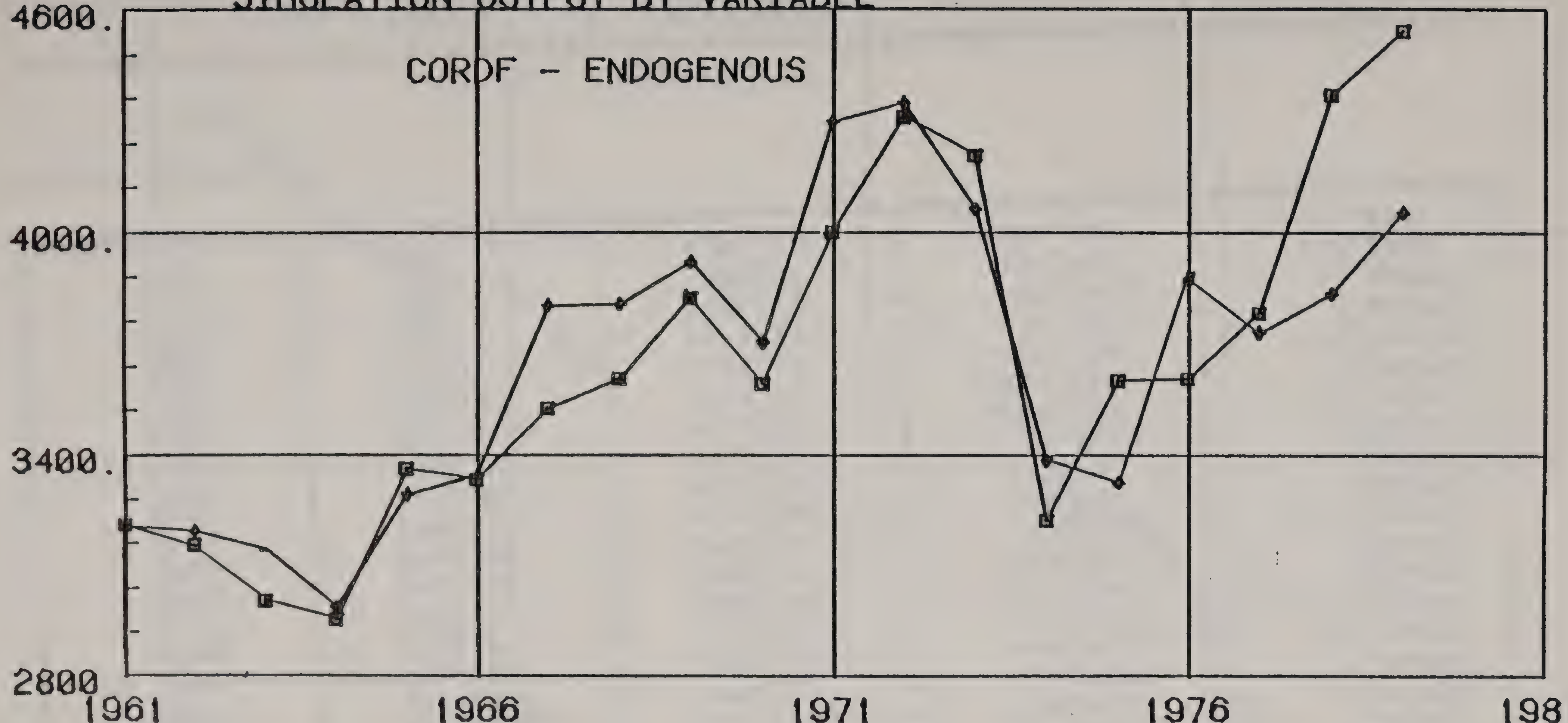
HARDF - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	240.918	214.812	-26.1057	-10.8359
1962	228.967	236.935	7.96848	3.48018
1963	233.5	233.239	-0.261246	-0.111883
1964	251.00	234.085	-16.9951	-6.76881
1965	202.	201.13	-0.870224	-0.430804
1966	209.	209.946	0.946411	0.452828
1967	205.	200.524	-4.47552	-2.18318
1968	227.	231.098	4.09842	1.80547
1969	248.	270.549	22.5491	9.09237
1970	287.	272.919	-14.0808	-4.90621
1971	266.	230.621	-35.3785	-13.3002
1972	238.	230.47	-7.53047	-3.16406
1973	232.	223.53	-8.46971	-3.65074
1974	180.	185.199	5.19945	2.88858
1975	182.	190.23	8.23045	4.52223
1976	161.	153.796	-7.20412	-4.47461
1977	168.	214.819	46.8186	27.8682
1978	206.	226.639	20.6391	10.019
1979	202.	210.663	8.6627	4.28847

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	219.34	219.537	0.196906	0.767945
RMS	221.725	221.194	17.7688	8.69051
STD.DEV	33.3191	27.7607	18.2546	8.89372

SIMULATION OUTPUT BY VARIABLE



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◊ #1 SIMULATE

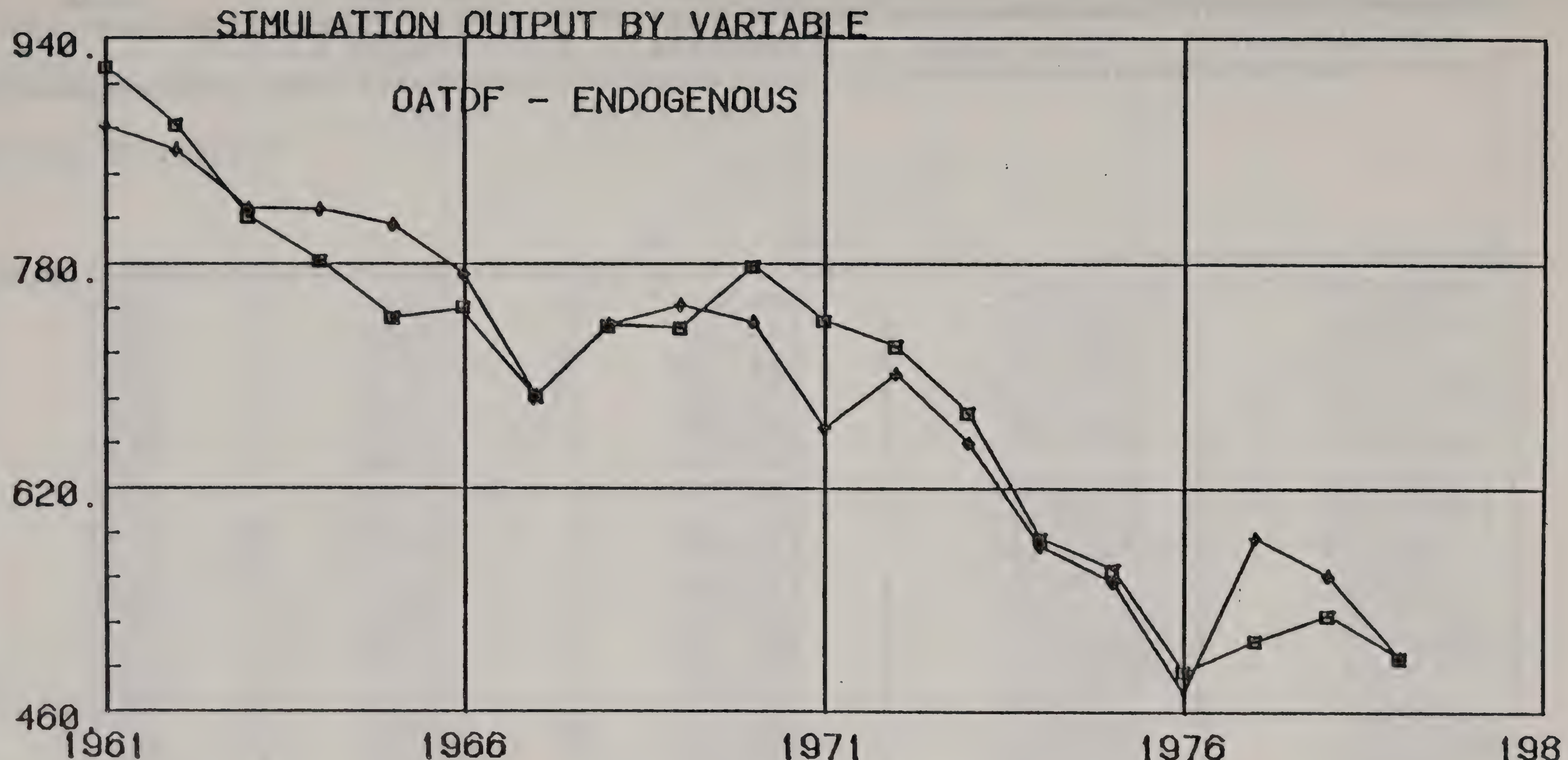
SIMULATION OUTPUT BY VARIABLE

CORDF = ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	3212.46	3208.03	-4.42871	-0.13786
1962	3155.84	3191.96	36.1187	1.1445
1963	3008.87	3141.79	132.912	4.41733
1964	2956.13	2990.57	34.4387	1.16499
1965	3362.23	3293.54	-68.6831	-2.04278
1966	3332.79	3342.99	10.1943	0.30588
1967	3523.96	3803.16	279.194	7.92274
1968	3607.02	3809.03	202.008	5.60041
1969	3824.68	3922.51	97.8242	2.55771
1970	3592.73	3701.54	108.806	3.02851
1971	4001.55	4298.59	297.04	7.42311
1972	4312.71	4348.23	35.5195	0.8236
1973	4204.8	4062.65	-142.145	-3.38053
1974	3225.64	3382.8	157.153	4.87199
1975	3603.	3323.69	-279.306	-7.75202
1976	3607.9	3882.93	275.03	7.62298
1977	3783.4	3730.13	-53.2693	-1.40797
1978	4368.5	3833.85	-534.651	-12.2388
1979	4544.	4051.29	-492.705	-10.843

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	3643.59	3648.38	4.79215	0.477934
RMS	3672.01	3669.65	227.649	5.68841
STD.DEV	468.401	405.316	233.835	5.82362



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◆ #1 SIMULATE

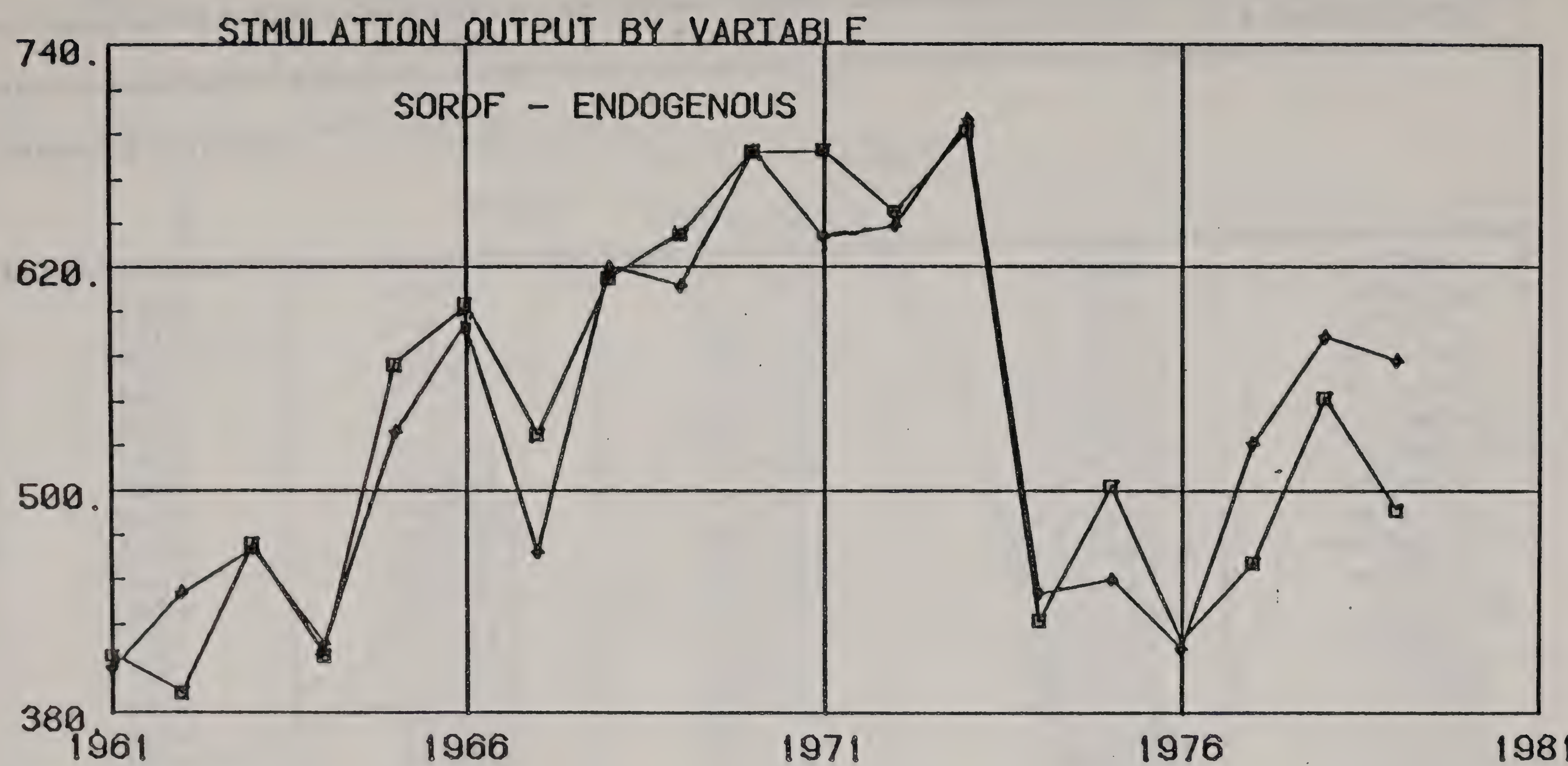
SIMULATION OUTPUT BY VARIABLE

DATDF = ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	919.723	877.924	-41.7988	-4.54472
1962	879.278	861.211	-18.0669	-2.05474
1963	813.321	819.758	6.43726	0.791478
1964	781.459	817.847	36.3879	4.65641
1965	742.	807.422	65.4216	8.81693
1966	749.	772.46	23.4602	3.1322
1967	686.	686.145	0.144531	0.021069
1968	736.	736.437	0.437012	0.059377
1969	735.	750.541	15.5408	2.11439
1970	778.	738.373	-39.627	-5.09344
1971	739.	663.228	-75.7725	-10.2534
1972	721.	701.632	-19.3679	-2.68626
1973	674.	652.33	-21.6699	-3.21512
1974	584.	577.581	-6.4187	-1.09909
1975	562.	552.847	-9.15308	-1.62866
1976	490.	473.88	-16.1201	-3.28982
1977	512.	584.721	72.7207	14.2033
1978	530.	557.58	27.5798	5.20374
1979	499.	498.853	-0.147217	-0.029502

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	691.094	691.091	-0.000642	0.268638
RMS	702.246	701.379	34.8692	5.28817
STD.DEV	128.071	122.958	35.8247	5.42607



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◇ #1 SIMULATE

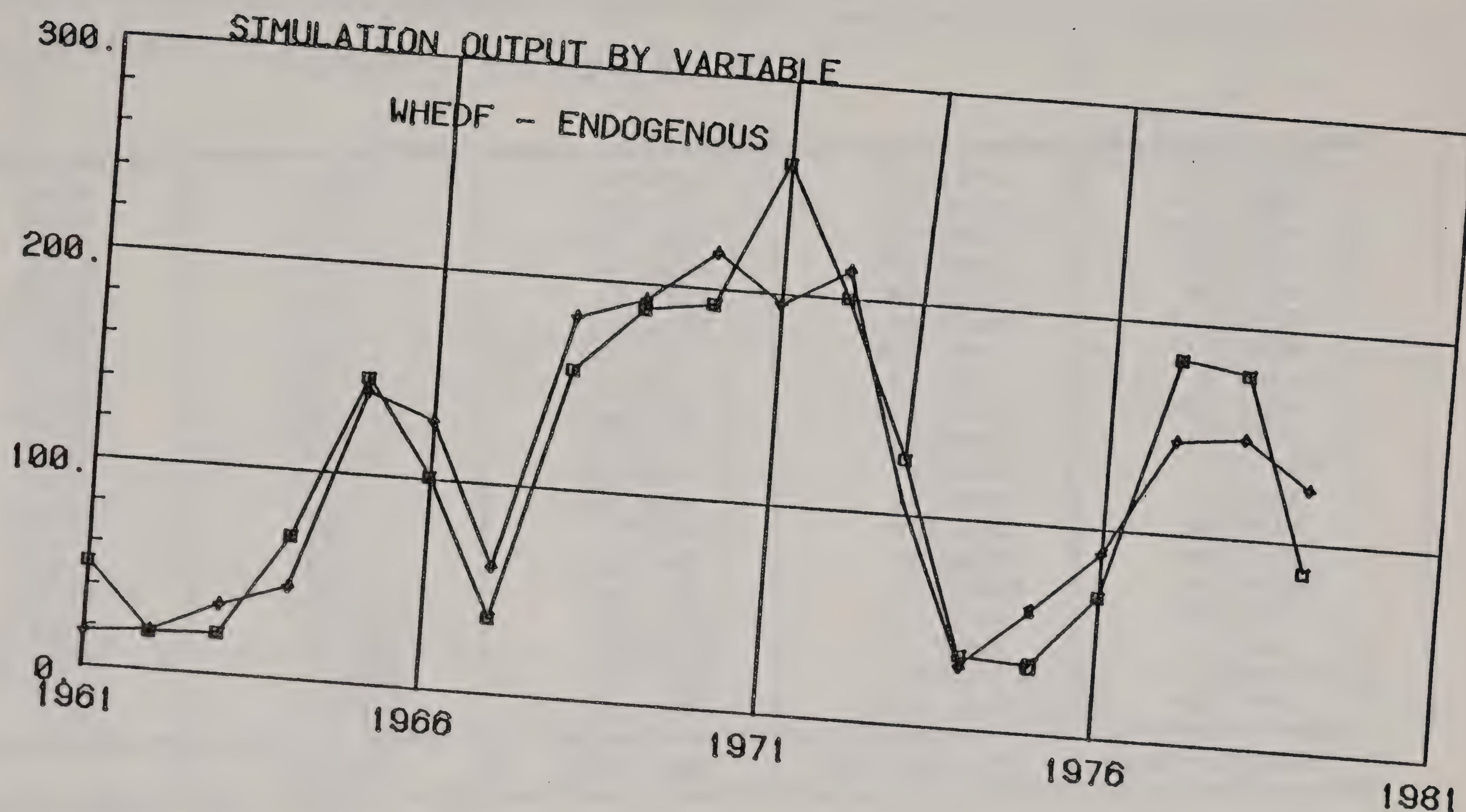
SIMULATION OUTPUT BY VARIABLE

SORDF - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	411.261	404.453	-6.80762	-1.6553
1962	391.692	445.031	53.3396	13.6177
1963	471.77	468.455	-3.31494	-0.70266
1964	411.545	417.861	6.31616	1.53474
1965	567.937	531.075	-36.8623	-6.49056
1966	600.546	589.982	-10.5635	-1.75898
1967	530.719	466.672	-64.0466	-12.0679
1968	613.743	619.15	5.40674	0.880943
1969	638.211	609.366	-28.8452	-4.5197
1970	683.272	683.125	-0.147217	-0.021546
1971	684.437	636.932	-47.5054	-6.94079
1972	651.678	643.186	-8.49219	-1.30313
1973	693.74	699.345	5.60522	0.807978
1974	430.558	445.083	14.5247	3.37345
1975	502.6	452.456	-50.1438	-9.97688
1976	419.1	414.771	-4.32935	-1.03301
1977	461.1	524.967	63.8667	13.8509
1978	549.2	582.569	33.3691	6.07595
1979	489.5	569.482	79.9822	16.3396

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	536.978	537.049	0.071173	0.526889
RMS	546.38	545.195	37.0419	7.47398
STD.DEV	103.687	96.4582	38.0569	7.65968



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◊ #1 STMULATE

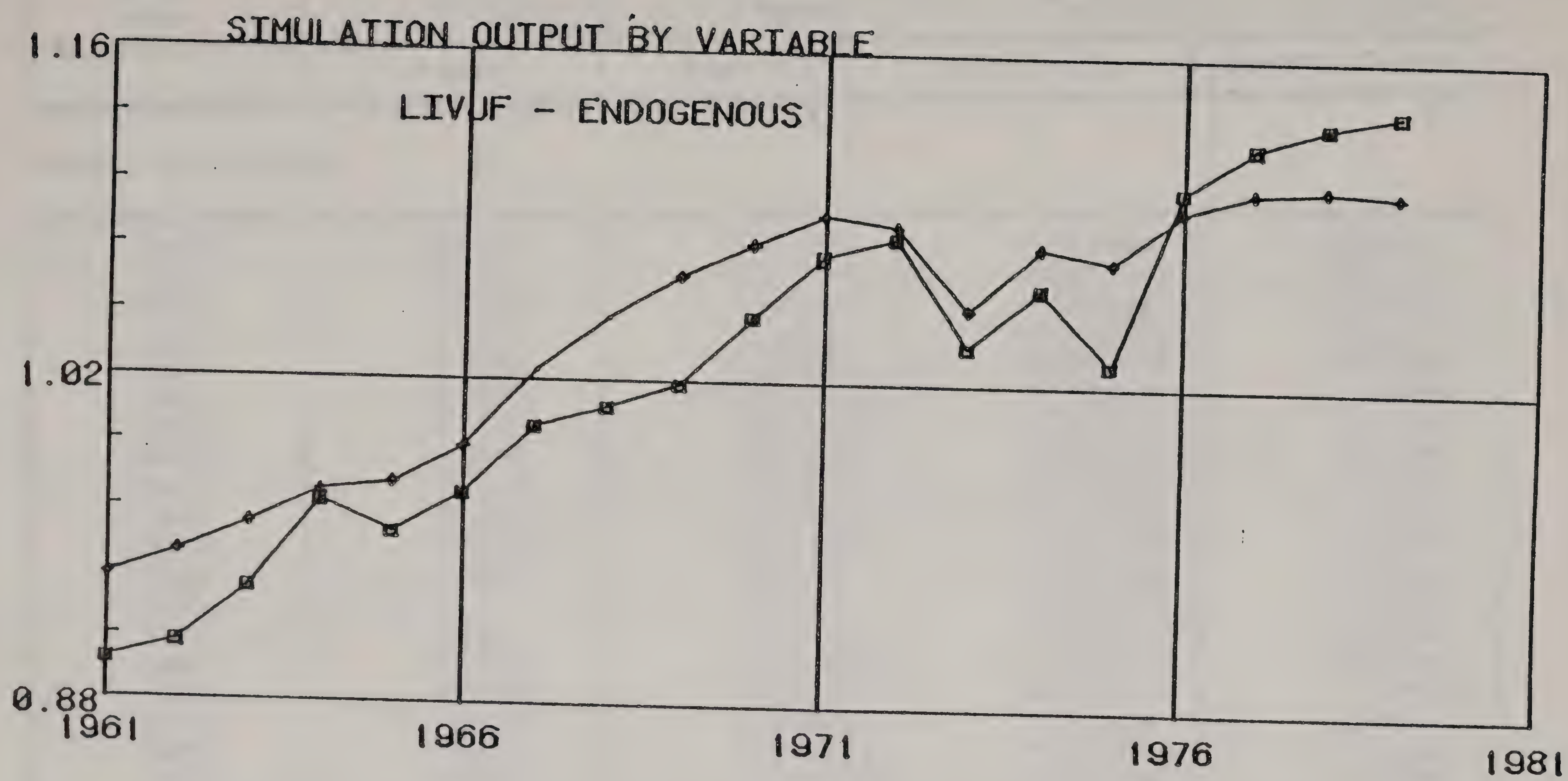
SIMULATION OUTPUT BY VARIABLE

WHEUF - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	50.146	17.4004	-32.7456	-65.3005
1962	18.515	19.2117	0.696671	3.76274
1963	20.217	33.6562	13.4393	66.475
1964	68.897	43.9919	-24.9051	-36.1482
1965	146.	138.678	-7.32198	-5.01505
1966	101.	127.845	26.8452	26.5794
1967	37.	61.1787	24.1787	65.3479
1968	157.	181.959	24.9589	15.8974
1969	188.	192.549	4.54936	2.41987
1970	193.	216.862	23.8617	12.3636
1971	262.	194.895	-67.1051	-25.6126
1972	200.	213.16	13.16	6.57998
1973	126.	105.636	-20.364	-16.1619
1974	35.	29.9246	-5.07544	-14.5012
1975	33.	59.5371	26.5371	80.4155
1976	68.	88.4695	20.4695	30.1022
1977	183.	144.492	-38.5076	-21.0424
1978	178.	147.553	-30.4474	-17.1053
1979	85.8	125.529	39.7287	46.3038

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	113.188	112.765	-0.423531	8.17684
RMS	134.19	130.893	27.7903	37.5852
STD.DEV	74.0547	68.2824	28.5485	37.6902



TIME BOUNDS: 1961 TO 1979

SYMBOL	SCALE	NAME
□	#1	ACTUAL
◇	#1	SIMULATE

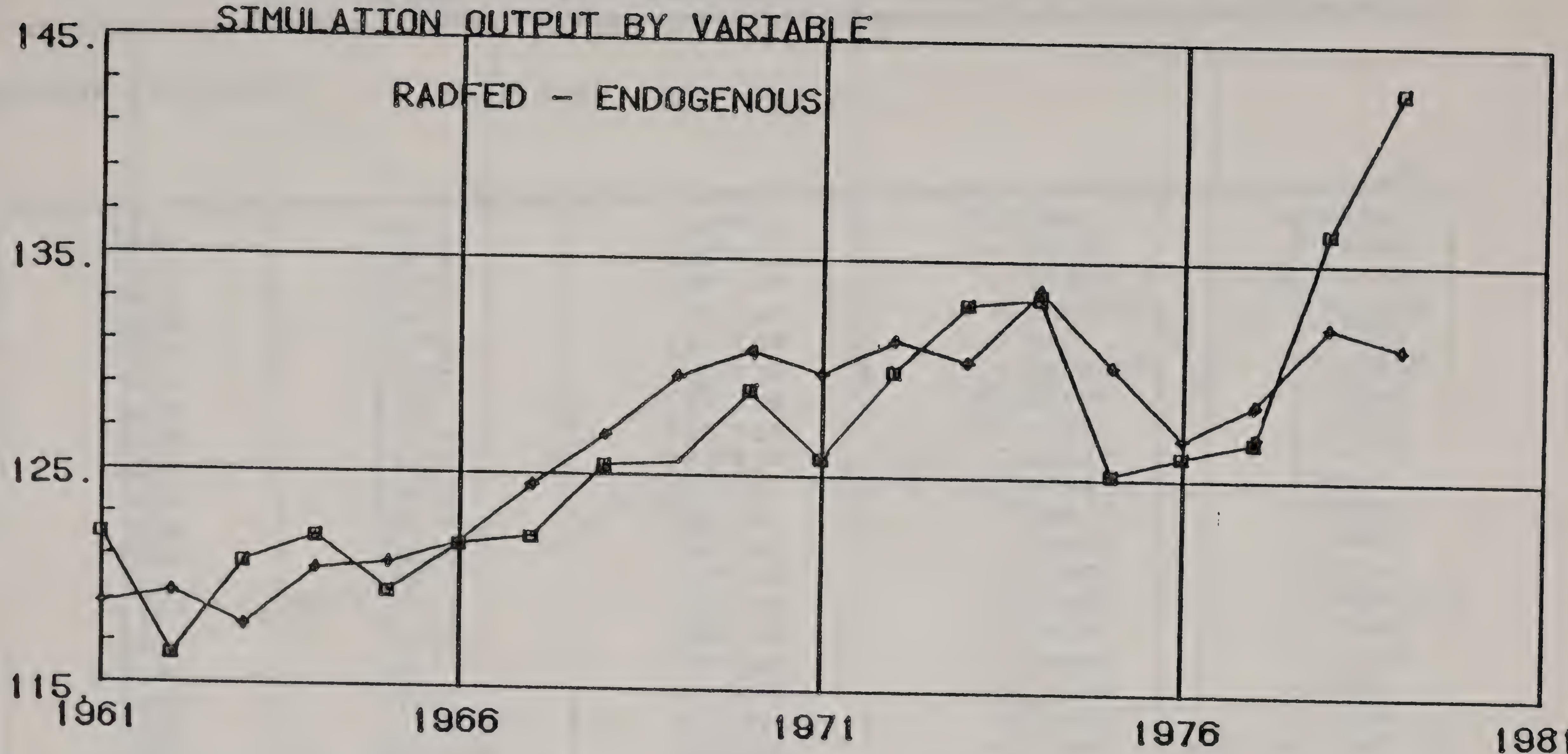
SIMULATION OUTPUT BY VARIABLE

LIVJF - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	0.898	0.934125	0.036125	4.02282
1962	0.906	0.944879	0.038879	4.29124
1963	0.93	0.95757	0.02757	2.96447
1964	0.967	0.971301	0.004301	0.444828
1965	0.954	0.975093	0.021093	2.21103
1966	0.971	0.990756	0.019756	2.03459
1967	1.	1.0236	0.023602	2.36015
1968	1.008	1.0463	0.038296	3.79918
1969	1.018	1.06392	0.045922	4.51103
1970	1.047	1.07861	0.031611	3.01924
1971	1.074	1.09136	0.017359	1.61627
1972	1.082	1.08652	0.004522	0.41796
1973	1.036	1.05118	0.015175	1.46475
1974	1.061	1.07851	0.017513	1.65064
1975	1.029	1.07259	0.043592	4.23639
1976	1.104	1.09538	-0.008624	-0.781166
1977	1.123	1.10397	-0.01903	-1.69453
1978	1.132	1.10494	-0.027061	-2.39059
1979	1.138	1.10308	-0.034921	-3.0686

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	1.02516	1.04072	0.015562	1.63735
RMS	1.0277	1.04233	0.027824	2.77487
STD.DEV	0.074247	0.059441	0.023697	2.3017



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□	#1	ACTUAL
◇	#1	SIMULATE

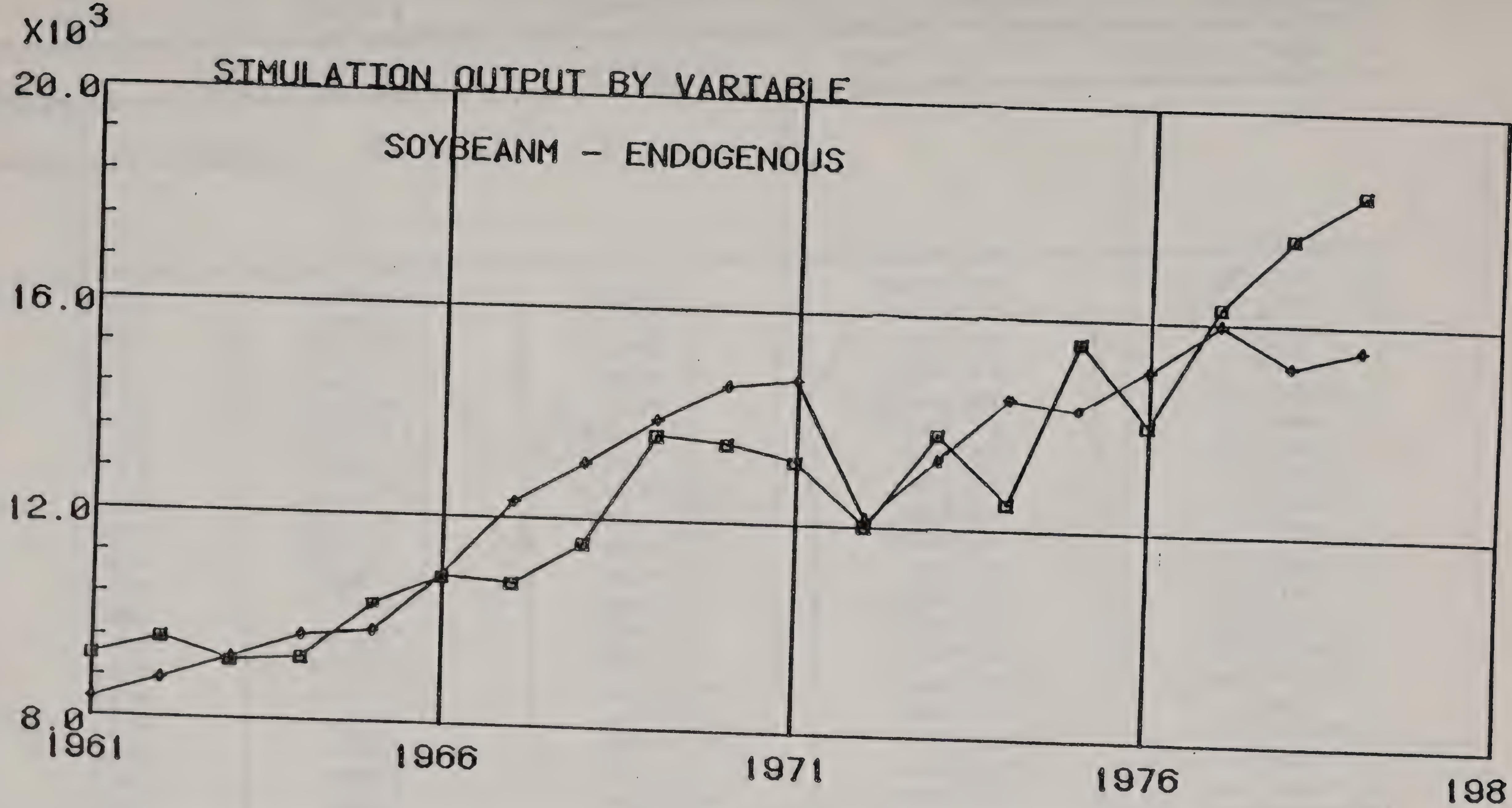
SIMULATION OUTPUT BY VARIABLE

RADFED - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	122.079	118.808	-3.27061	-2.6791
1962	116.472	119.334	2.86183	2.4571
1963	120.8	117.866	-2.93387	-2.4287
1964	122.	120.507	-1.49275	-1.22357
1965	119.5	120.765	1.2654	1.05891
1966	121.7	121.813	0.11319	0.093007
1967	122.1	124.449	2.34851	1.92343
1968	125.4	126.787	1.38737	1.10636
1969	125.6	129.48	3.88013	3.08927
1970	128.9	130.73	1.83012	1.4198
1971	125.8	129.626	3.82576	3.04114
1972	129.8	131.276	1.47597	1.13711
1973	133.	130.242	-2.75841	-2.07399
1974	133.3	133.698	0.398468	0.298926
1975	125.2	130.094	4.8936	3.90863
1976	126.	126.796	0.796143	0.631859
1977	126.7	128.416	1.71587	1.35427
1978	136.4	132.077	-4.32307	-3.16941
1979	142.9	131.134	-11.7655	-8.23341

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	126.508	126.521	0.013058	0.090086
RMS	126.662	126.62	3.74452	2.79568
STD.DEV	6.41544	5.13447	3.8471	2.8708



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

◻	#1	ACTUAL
◊	#1	SIMULATE

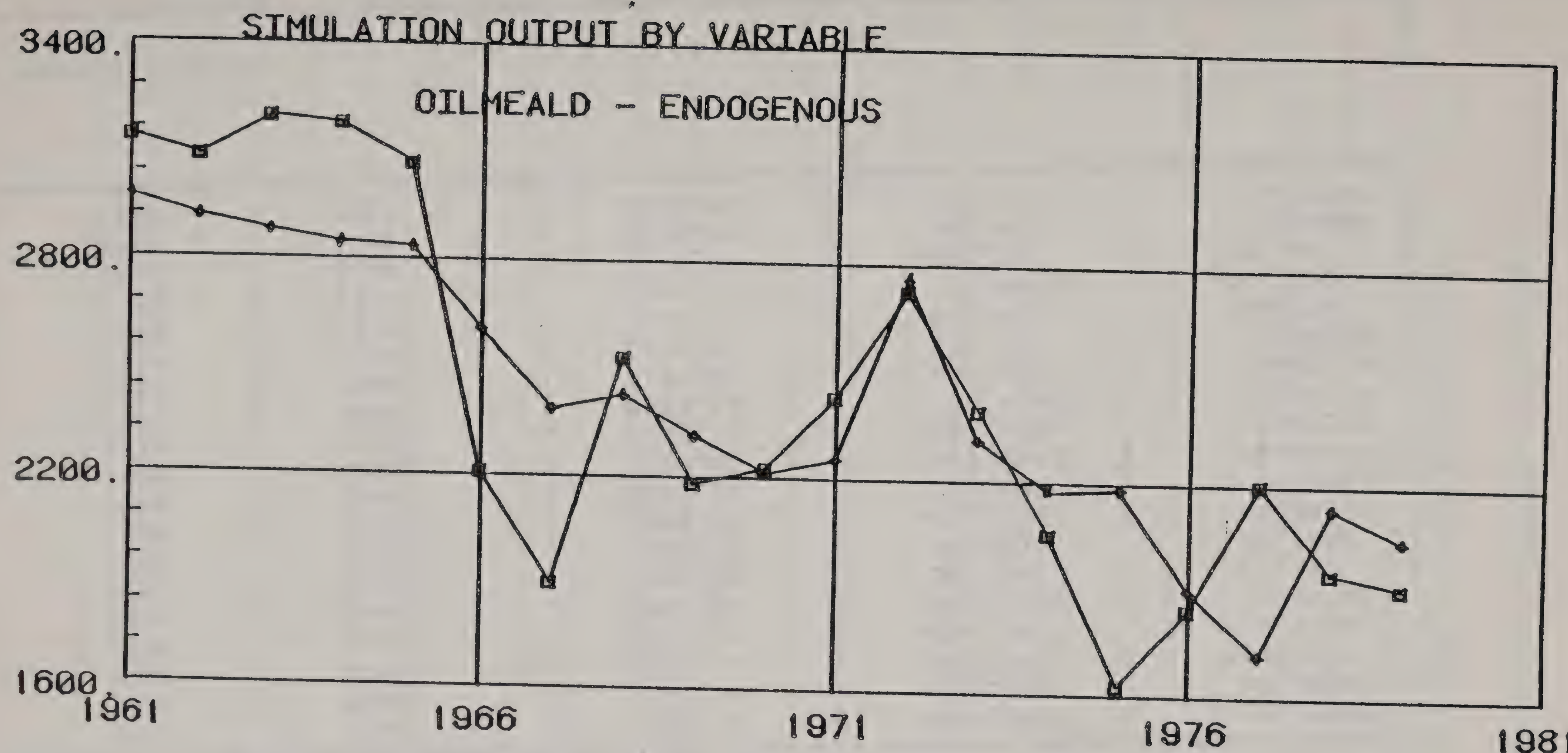
SIMULATION OUTPUT BY VARIABLE

SOYBEANM - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	9232.	8385.39	-846.613	-9.17042
1962	9556.	8762.34	-793.656	-8.30532
1963	9138.	9200.55	62.5547	0.684555
1964	9236.	9665.87	429.871	4.6543
1965	10274.	9781.86	-492.141	-4.79016
1966	10820.	10876.9	56.9062	0.525936
1967	10753.	12283.9	1530.93	14.2373
1968	11525.	13031.4	1506.35	13.0703
1969	13582.	13904.8	322.773	2.37648
1970	13467.	14547.5	1080.54	8.0236
1971	13173.	14697.2	1524.23	11.5709
1972	11972.	12108.8	136.777	1.14248
1973	13766.	13287.1	-478.859	-3.47857
1974	12501.	14462.3	1961.33	15.6894
1975	15552.	14254.9	-1297.08	-8.34029
1976	14001.	15037.3	1036.32	7.40173
1977	16277.	15965.5	-311.48	-1.91362
1978	17623.	15203.3	-2419.74	-13.7306
1979	18462.6	15522.1	-2940.52	-15.9269

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	12679.5	12683.1	3.60506	0.722159
RMS	12976.	12915.7	1286.34	9.19278
STD.DEV	2833.75	2506.86	1321.58	9.41549



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 ACTUAL

◊ #1 SIMULATE

SIMULATION OUTPUT BY VARIABLE

OILMEALD - ENDOGENOUS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
1961	3140.	2971.72	-168.275	-5.35909
1962	3086.	2915.58	-170.416	-5.52223
1963	3196.	2873.66	-322.344	-10.0859
1964	3179.	2844.64	-334.36	-10.5178
1965	3064.	2834.21	-229.792	-7.49972
1966	2208.	2605.26	397.263	17.992
1967	1897.	2385.02	488.016	25.7257
1968	2529.	2426.57	-102.432	-4.05029
1969	2181.	2313.13	132.128	6.05813
1970	2223.	2212.68	-10.3206	-0.464262
1971	2423.	2252.1	-170.896	-7.05309
1972	2726.	2758.62	32.6206	1.19665
1973	2392.	2309.8	-82.1978	-3.43636
1974	2053.	2171.32	118.32	5.76325
1975	1635.	2178.	542.995	33.2107
1976	1849.	1901.98	52.9812	2.8654
1977	2198.	1718.61	-479.385	-21.81
1978	1951.	2135.64	184.635	9.46362
1979	1911.13	2043.24	132.107	6.91249

SUMMARY STATISTICS

	ACTUAL	SIMULATE	SIMULATE_ER	SIMULATE_PCER
MEAN	2412.69	2413.25	0.560367	1.75732
RMS	2463.21	2439.88	269.495	12.9514
STD.DEV	509.89	369.332	276.879	13.1832

Section III

Dynamic Analysis of the U.S. Livestock Supply Model

In the previous section the estimated submodels were validated with respect to the historical data. This validation implies that there exists solutions to the model and that these solutions resemble the historical data of the endogenous variables in the model. While it is reassuring that the model may have at least some validity for the historical data, the existence of these solutions does not give by itself any assurance that the model will well behave outside the range of its historical data or that it will even solve when using new data. While it is very difficult to forecast how well an econometric model will do outside the range of data that was used to estimate it, analysis of the dynamic characteristics of the model may give a clue as to the existence of solutions when new data is used. It is the purpose of this section to explore the dynamic characteristics of the U.S. livestock supply model.

As can be easily realized, the estimated models pertaining to livestock supply may be looked upon as a nonlinear homogeneous system of difference equations. In general such systems are not stationary. However, if the system is not too far from being linear or the dynamic properties change only slowly through time, it is possible to deduce these properties for a particular time interval. The only nonlinearities present in the different components of the livestock supply model are related to the exogenous price ratios and to some production variables that are obtained from multiplying yields by the number of producing units.

The following is a general linearized representation of the reduced form equations of any of the submodels presented in the previous section:

$$(1) \quad Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + A_3 Y_{t-3} + B_1 X_t$$

or in matrix notation:

$$(2) \begin{bmatrix} Y_t \\ Y_{t-1} \\ Y_{t-2} \end{bmatrix} = \begin{bmatrix} A_1 & A_2 & A_3 \\ I & 0 & 0 \\ 0 & I & 0 \end{bmatrix} \begin{bmatrix} Y_{t-1} \\ Y_{t-2} \\ Y_{t-3} \end{bmatrix} + \begin{bmatrix} B_1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} X_t \\ 0 \\ 0 \end{bmatrix}$$

which may be represented as

$$(3) \quad y_t = Ay_{t-1} + Bx_t$$

If at time t, x_t is changed to x^* and kept at that level n periods, than after n periods we obtain

$$(4) \quad y^*_{t+n} = A^{n+1} y_{t-1} + (A^n + A^{n-1} + \dots + A + I)\ Bx^*$$

If the system is stable; then y^*_{t+n} has to converge to a solution as $n \to \infty$. Let

$$(5) \quad A^n + A^{n-1} + \dots A + I = S_n$$

Then

$$(6) \quad S_n - AS_n = (I - A)\ S_n = I - A^{n+1}$$

Therefore, if as $n \to \infty$, $A^{n+1} \to 0$ then

$$(7) \quad S = (I - A)^{-1}$$

It follows that the system will reach a new stationary equilibrium at

$$(8) \quad y^* = (I - A)^{-1}\ Bx^*$$

Therefore, if the system is stable, there will exist solutions to the model outside the original data range.

As it is well known $[S_nB]$ stands for the cumulitative multiplier up to n- periods after the initial change has been made and [SB] stands for the long-run multiplier.

If our models would have been linear, the above description of the necessary conditions for a stable dynamic system imply that

$$(9) \quad \Delta y_{t+n} = A^n B\ \Delta x_t \to 0 \text{ as } n \to \infty$$

where $\Delta x_t = x_t^{\star} - x_t$.

Notice that expression (9) as a function of n stands for the impact and the delayed effects of a one time change of x at time t.

But

$$(10) \quad A^n B = C\, D_\lambda^n\, C^{-1}\, B$$

where C stands for the matrix of the characteristic vectors of A and D_λ stands for a diagonal matrix which consists of the corresponding characteristic roots. It follows that Δy_{t+n} is a linear combination of the roots of A each raised to the power of n. Therefore, solutions such as in (8) depend on whether all of roots of A are smaller than 1 in absolute value. Moreover, if the system is stable, equation (9) indicates the adjusting pattern of the system towards its stationary solution. So, the adjustment pattern will be oscillatory if some roots are negative or complex.

Because of the nonlinearities present in the livestock supply components no attempt was made to obtain a linearized version of $A^n B$ and its decomposition as in (10). Instead, the successive values of the resulting current and delayed changes in the endogenous variables from a one time change in any of the exogenous variables were computed for the time intervals in which each supply component was estimated. As it will be shown, all of the livestock supply components are stable in the sense that the delayed reactions of the endogenous variables tend to vanish as the time since the initial perturbation was affected increases. Accordingly, any sustained change in the exogenous variables will result in a new stationary (long-run) equilibrium. These equilibrium values will also be dealt with in the subsequent presentation.

III.1 Dynamic Characteristics of the Beef and Dairy Component

Our previous discussion was focused on the existence and stability of solutions outside the original data base. Even if these solutions exist they may not be in compliance with existing theory or with perceived knowledge concerning the particular sector analyzed. Therefore, the empirical analysis of the adjustment patterns and the long-run changes in the endogenous variables resulting from exogenous shocks should provide an additional criterion for model credibility and validation.

In the beef and dairy submodel 3 kinds of exogenous shocks were tested: a) An increase in the price of corn by 10%; b) An increase in the farm price of milk by 10%; c) A simultaneous increase of 10% in the farm prices of steers, choice feeder cattle, utility cows and veal. In general it can be said that because of a slow adjusting process a steady state solution is not obtained in the time interval in which these tests were performed. But as can be seen from the following tables, the changes in the delayed multipliers from period n to period n+1 decrease in absolute value as n increases. This means that as n increases the delayed multipliers tend to vanish implying that the steady state solutions will eventually be obtained.

Before we proceed we should be specific about the meaning of the headings in the tables shown in the Appendix to section III.

$$\text{Imp. Mult.}\quad y_{t+n} = \frac{\Delta y_{t+n}}{\Delta x_t} = A^n B \qquad n \geq 0$$

$$\text{Cum. Mult.}\quad y_{t+n} = \sum_{i=0}^{n} \frac{\Delta y_{t+i}}{\Delta x_t} = \sum_{i=0}^{n} A^i B$$

where

y_{t+n} = the endogenous variable n periods after the initial change in the exogenous variable was affected,

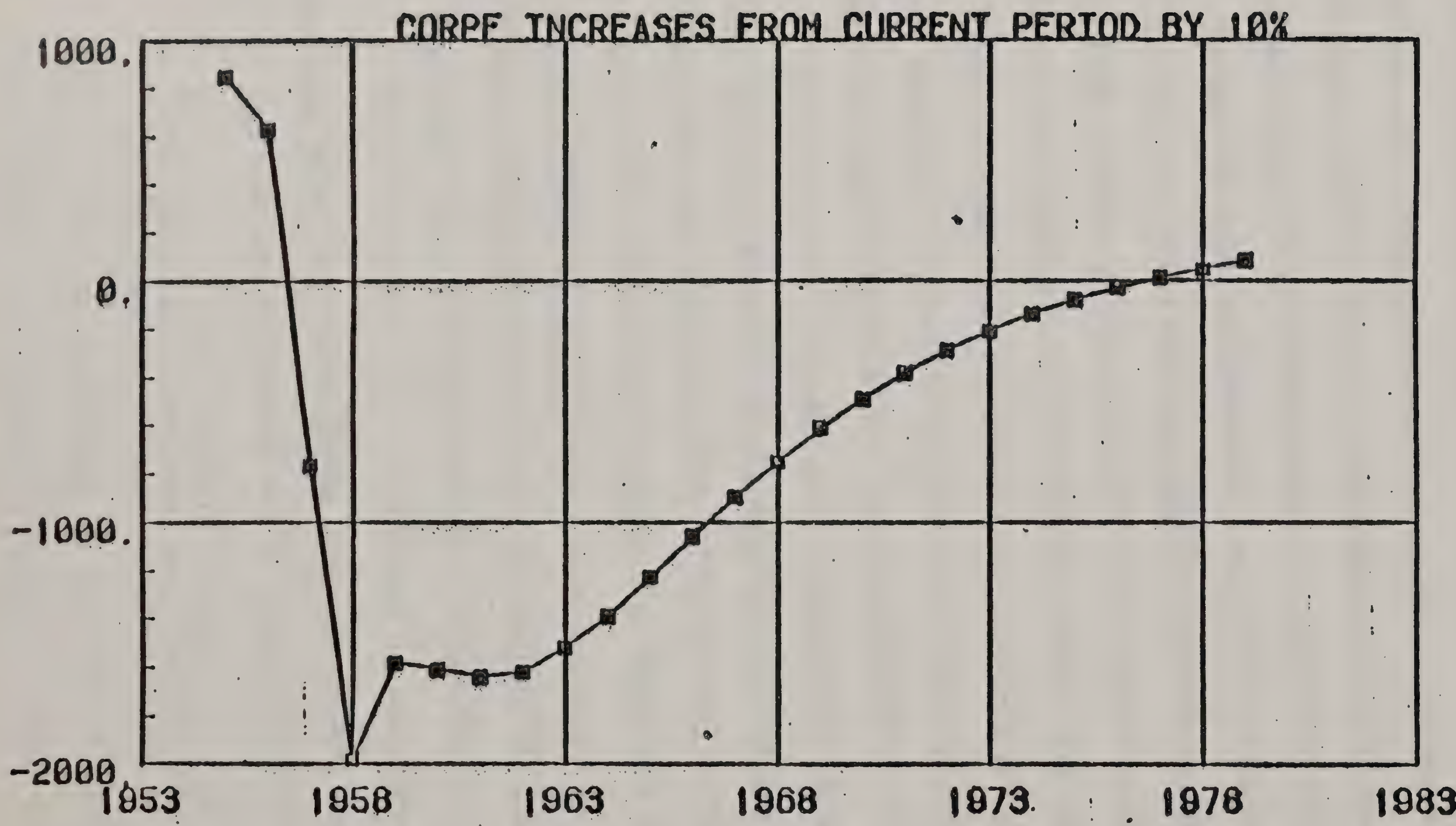
x_t = the exogenous variable that was changed in period t.

We first analyze the implications of increasing the farm price of corn. The adjustment pattern for different endogenous variables as seen from the

columns headed "imp. mult." in the tables appearing in the Appendix to this section have certain similarities. As far as the slaughter of calves, non-fed cattle and dairy cows are concerned, the adjustment is first positive, namely the number of animals slaughtered increases, but eventually these slaughter decreases. On the other hand, the numbers of fed steers and heifers slaughtered first decrease and then eventually increase. These results stem from the fact that as the price of corn increases the capital value of livestock diminishes inducing farmers to disinvest. For non-fed livestock, disinvestment takes the form of increased slaughter while at the same time less animals are fed and therefore less fed animals will be slaughtered. In terms of beef production this implies that long-run production of non-fed beef and veal increases while the long-run production of fed beef declines. Since fed beef constitutes about 80% of total beef produced, total beef production will decline in the long-run. Notice that the long-run effects are presented under the heading of "cum. mult.".

As far as the effect of an increase in the price of corn on milk production there are two factors to consider: one is the effect on yield and the other is the effect on the number of dairy cows. As far as the number of cows are concerned, the long-run impact is clearly negative. On the other hand, the long-run impact on yield is positive because the yield is negatively affected by the number of dairy cows. The total effect on milk production is negative.

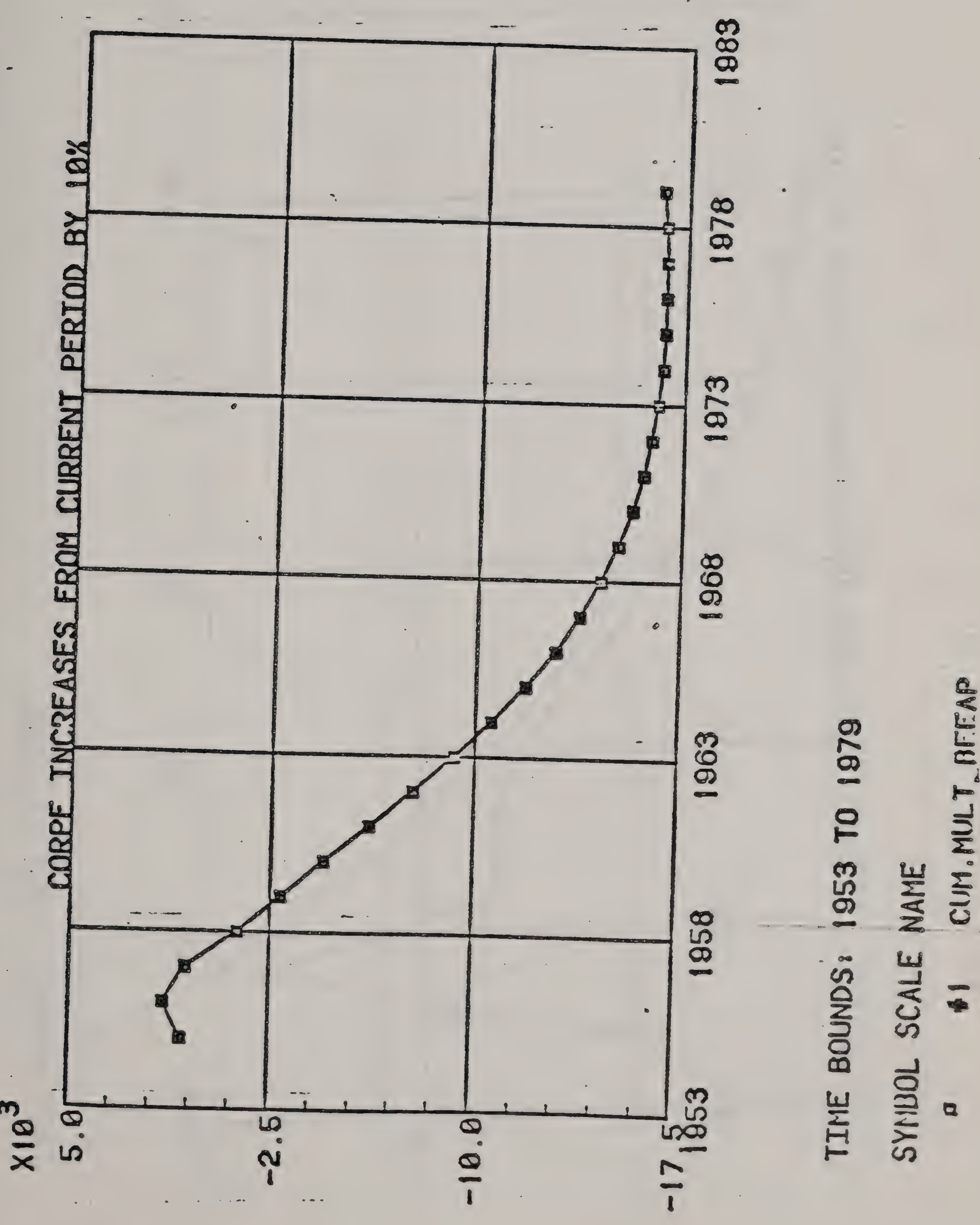
Some of these results are shown graphically. The tables presenting the detailed computations appear in the Appendix to this section.

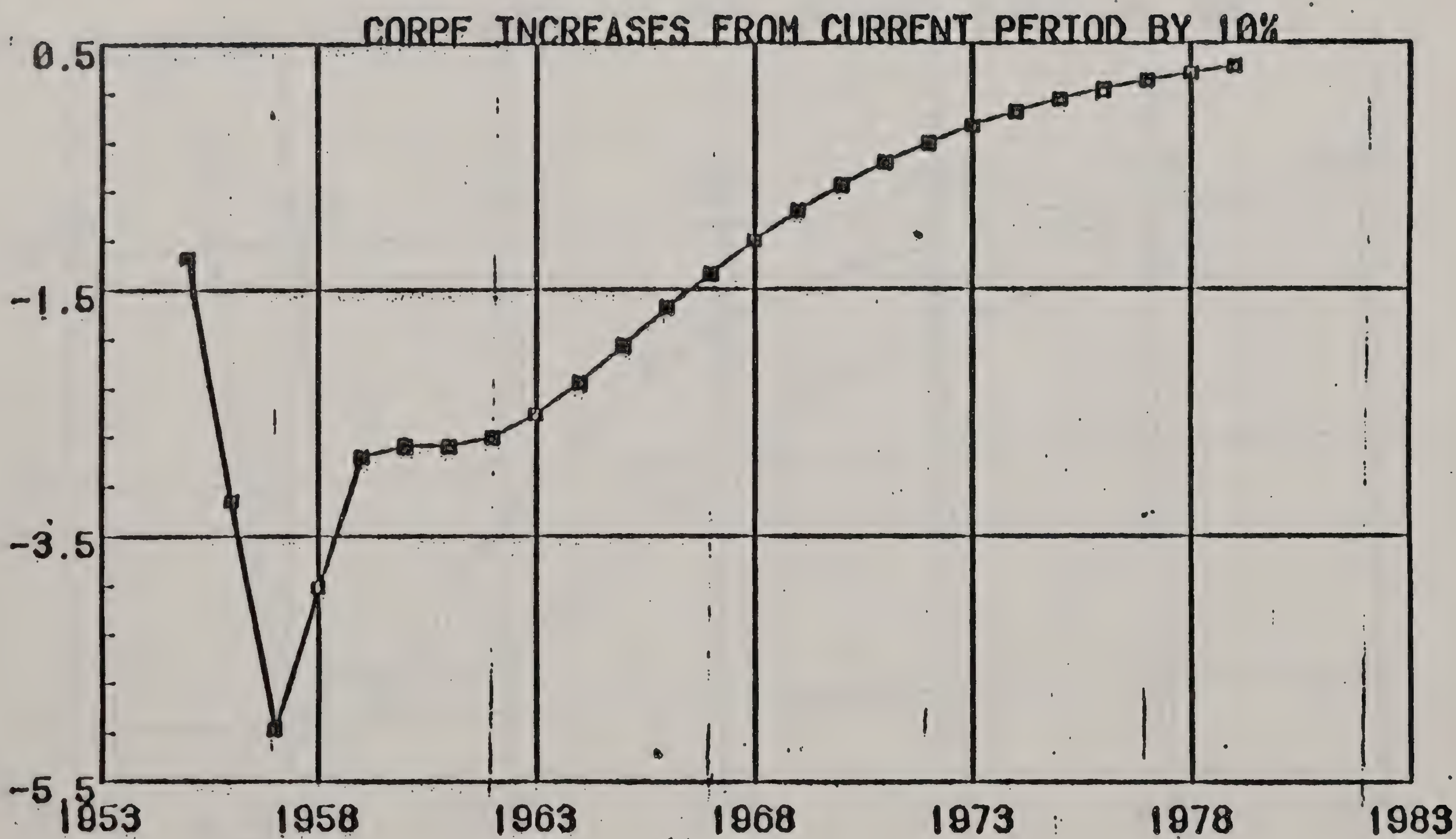


TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

□ #1 IMP,MULT_BEEAP

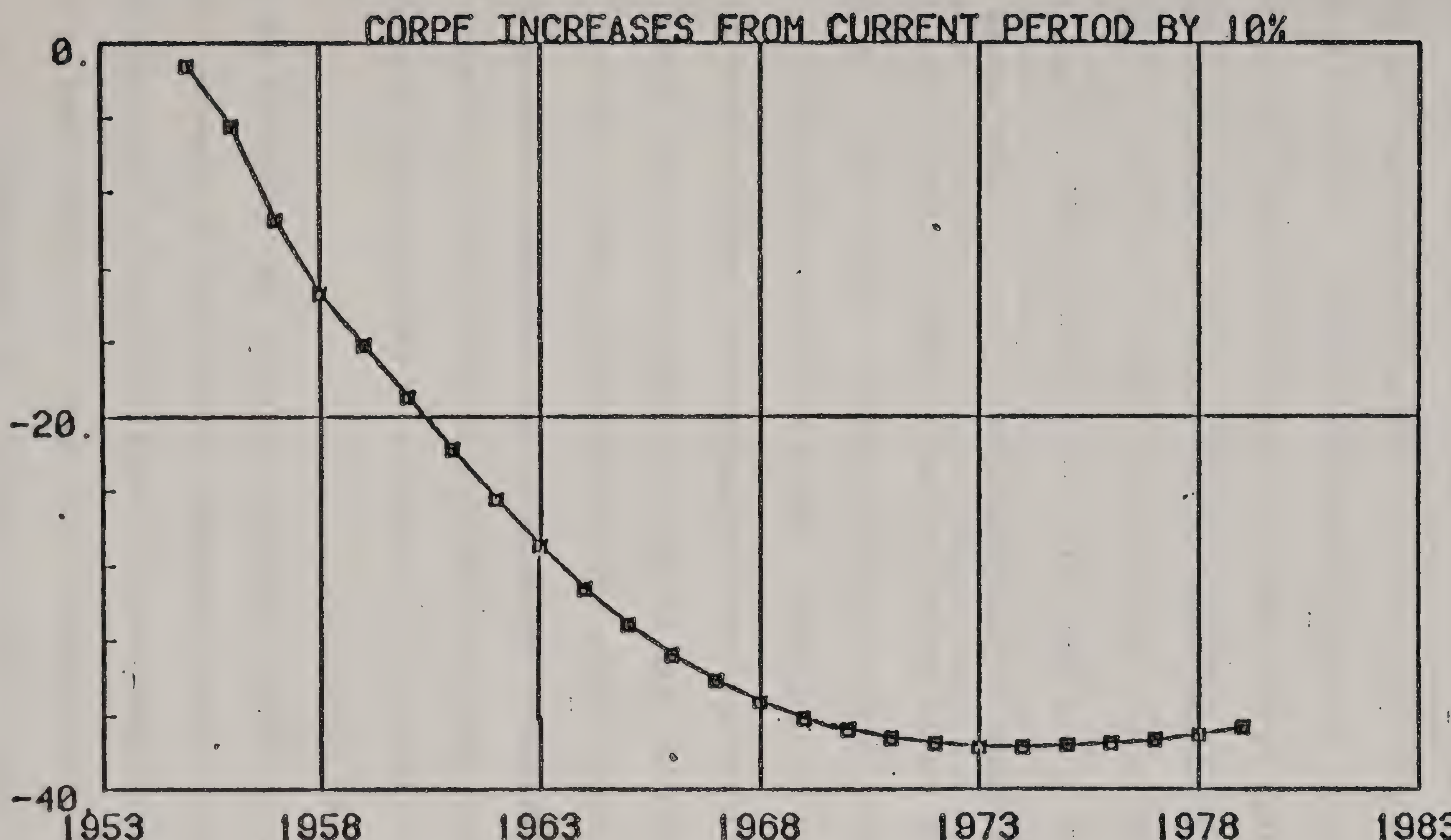

CORPF INCREASES FROM CURRENT PERIOD BY 10%
X10^3
5.0
-2.5
-10.0
-17.5
1953
1958
1963
1968
1973
1978
1983
TIME BOUNDS: 1953 TO 1979
SYMBOL SCALE NAME
□ #1 CUM.MULT_BFEAP



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

#	#1	IMP.MULT_SAHKSFD



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

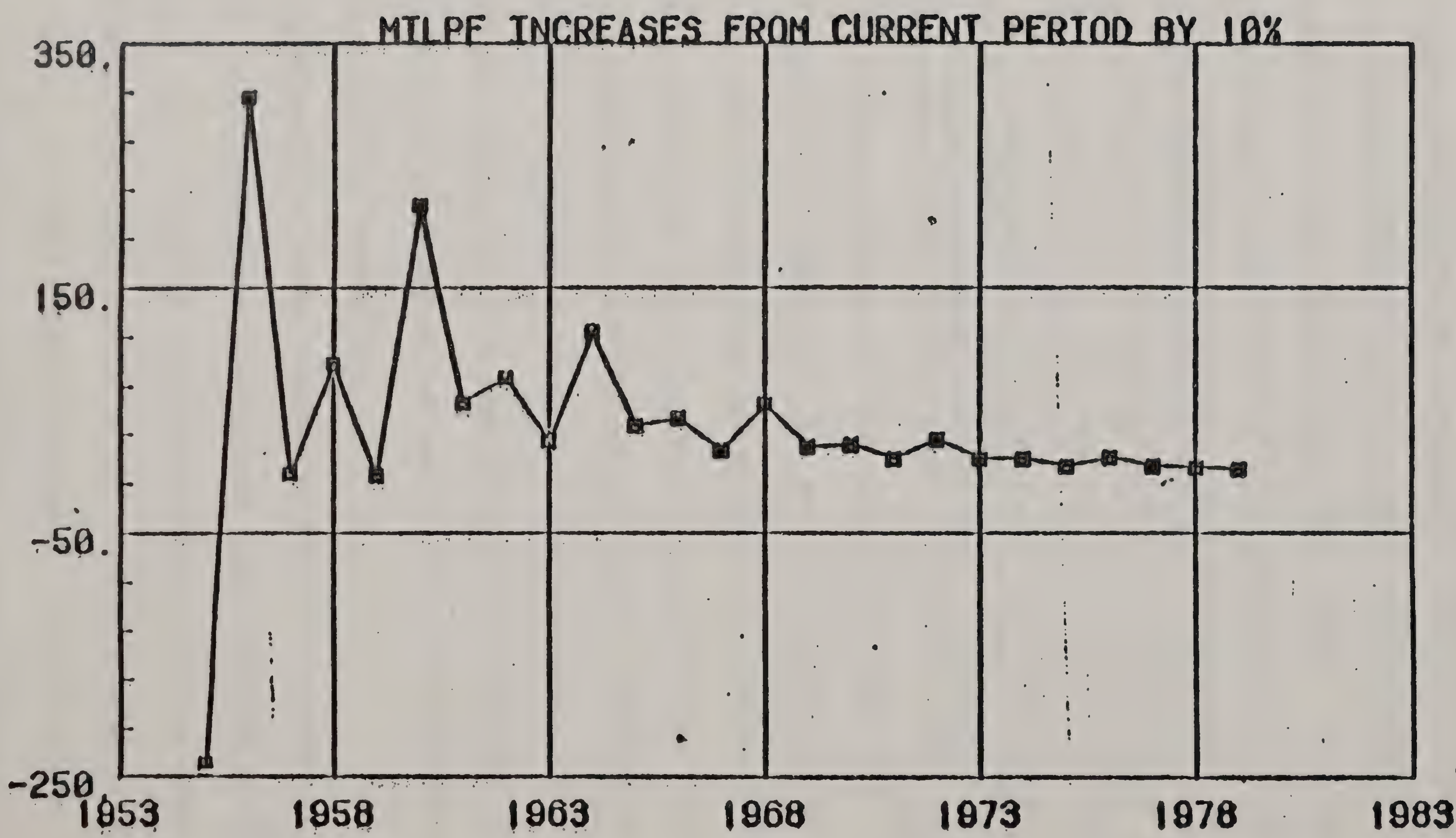
□ #1 CUM.MULT_SAHKSFD

Next, the effects of a 10% increase in the farm price of milk is considered. Here, an oscillatory pattern of a convergent adjustment mechanism is generally observed. This oscillatory pattern is generated by the interplay of investments and disinvestment decisions as exemplified by the adjustment mechanism in the number of dairy cows slaughtered. As far as the numbers of dairy cows slaughtered are concerned, an increase in the price of milk has two contradictory effects. From the behavioral equations presented in the previous section we know that the numbers of dairy cows slaughtered depend on the current and lagged additions of heifers to the dairy herd and on the current farm price of milk. While an increase in the farm price of milk brings about an immediate reduction in the number of slaughtered dairy cows, it also brings about an increase in the current number of heifers added to the dairy herd. This current increase in the number of hiefers will also bring about a reduction in slaughter. But as more heifers are added to the dairy herd and less dairy cows are slaughtered, the dairy herd will increase, allowing for more slaughter of dairy cows in the future. These two conflicting forces characteristically generate the oscillatory pattern in the adjustment mechanism of the endogenous variables in the beef and dairy model to a changing price of milk and is responsible for the long-run increase in the numbers of non-fed cattle slaughtered and in non-fed beef production.

The effect of a price increase of milk on the numbers of fed and non-fed steers and heifers slaughtered stems from the relation between steer and heifer slaughter and the stock of calves on farm and from the dependency of these stocks on the stock of the dairy herd which is obviously affected by dairy slaughter. As the numbers of fed steers and heifers slaughtered in the long-run increases, fed beef production will also increase.

The effects of an increase in the farm price of milk on the yield of milk is related to a positive direct component and a negative indirect component. The indirect component stems from the negative effect that the size of the dairy herd has on milk yield and on the positive effect that an increase in the farm price of milk has on the dairy herd. These two conflicting effects have an oscillatory effect on the adjusting pattern of the milk yield as the farm price of milk increases. A similar pattern of adjustment can be observed for the quantity of milk produced. As a result of these conflicting forces milk yield will decline in the long-run but milk production will increase.

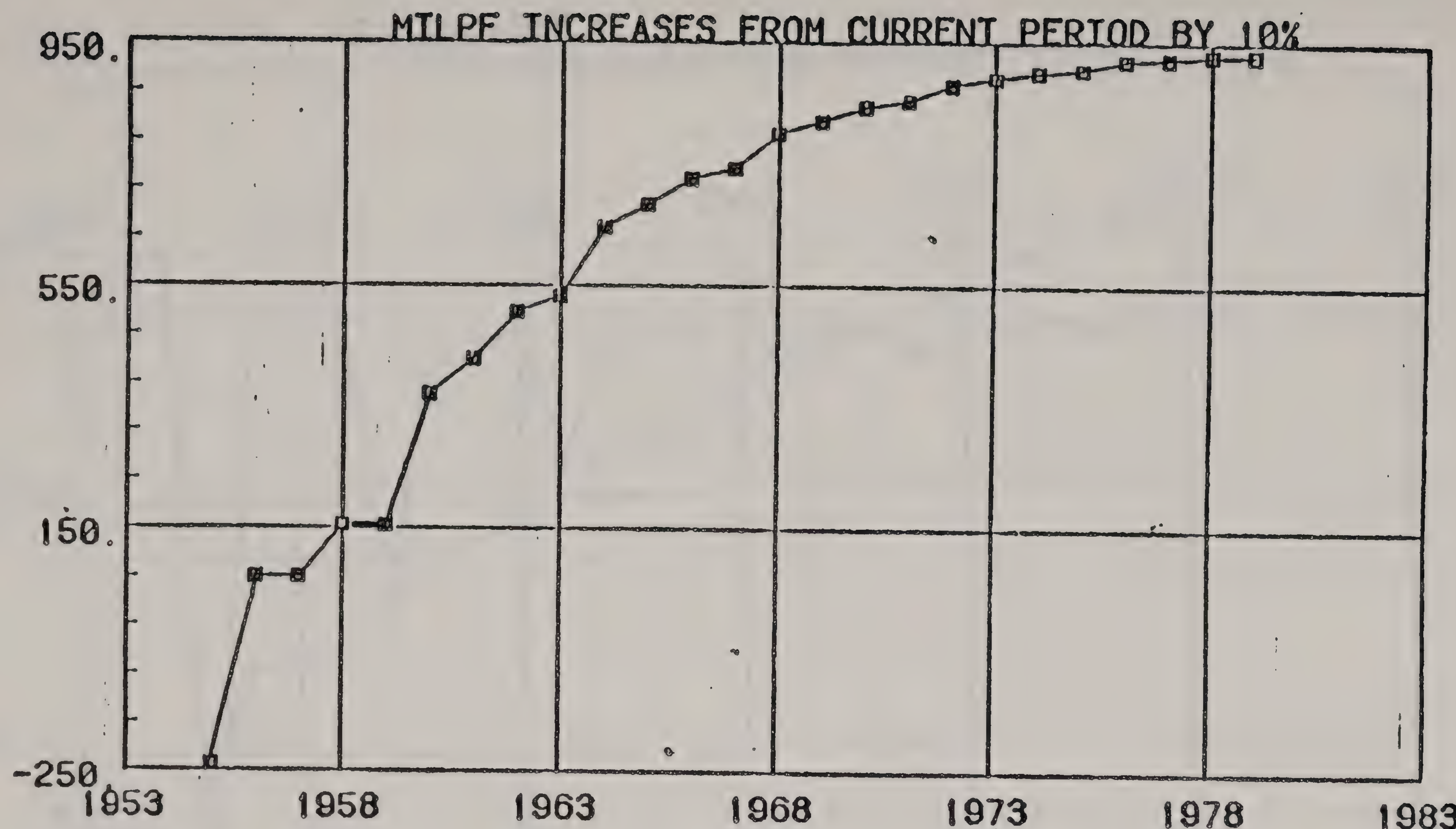
The tables showing the detailed short-run and long-run implications of an increase in the farm price of milk appear in the Appendix to Section III. Some of these results are presently shown graphically.



TIME BOUNDS: 1953 TO 1979

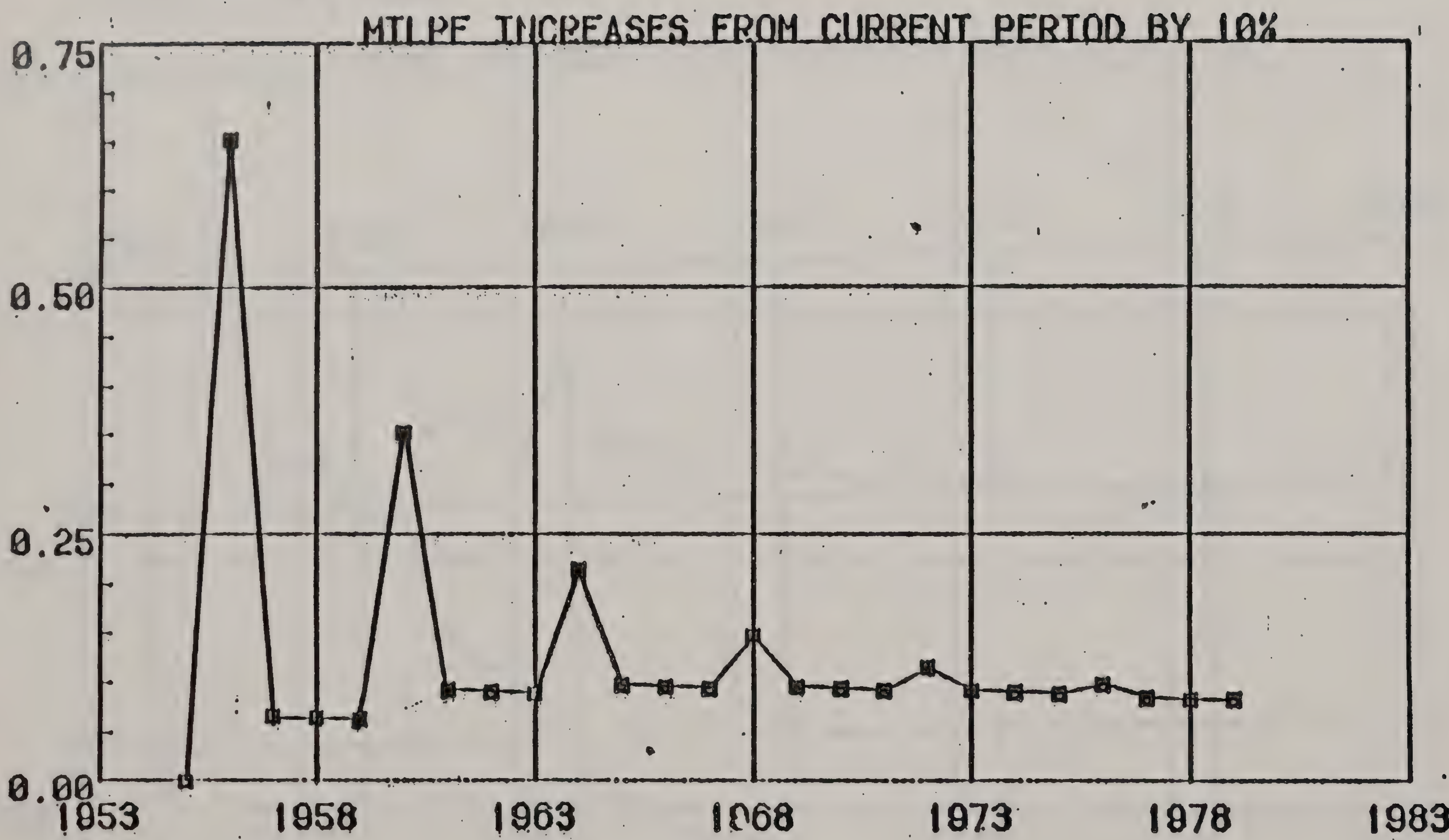
SYMBOL SCALE NAME

□ #1 IMP.MULT_BEEAP



TIME BOUNDS: 1953 TO 1979

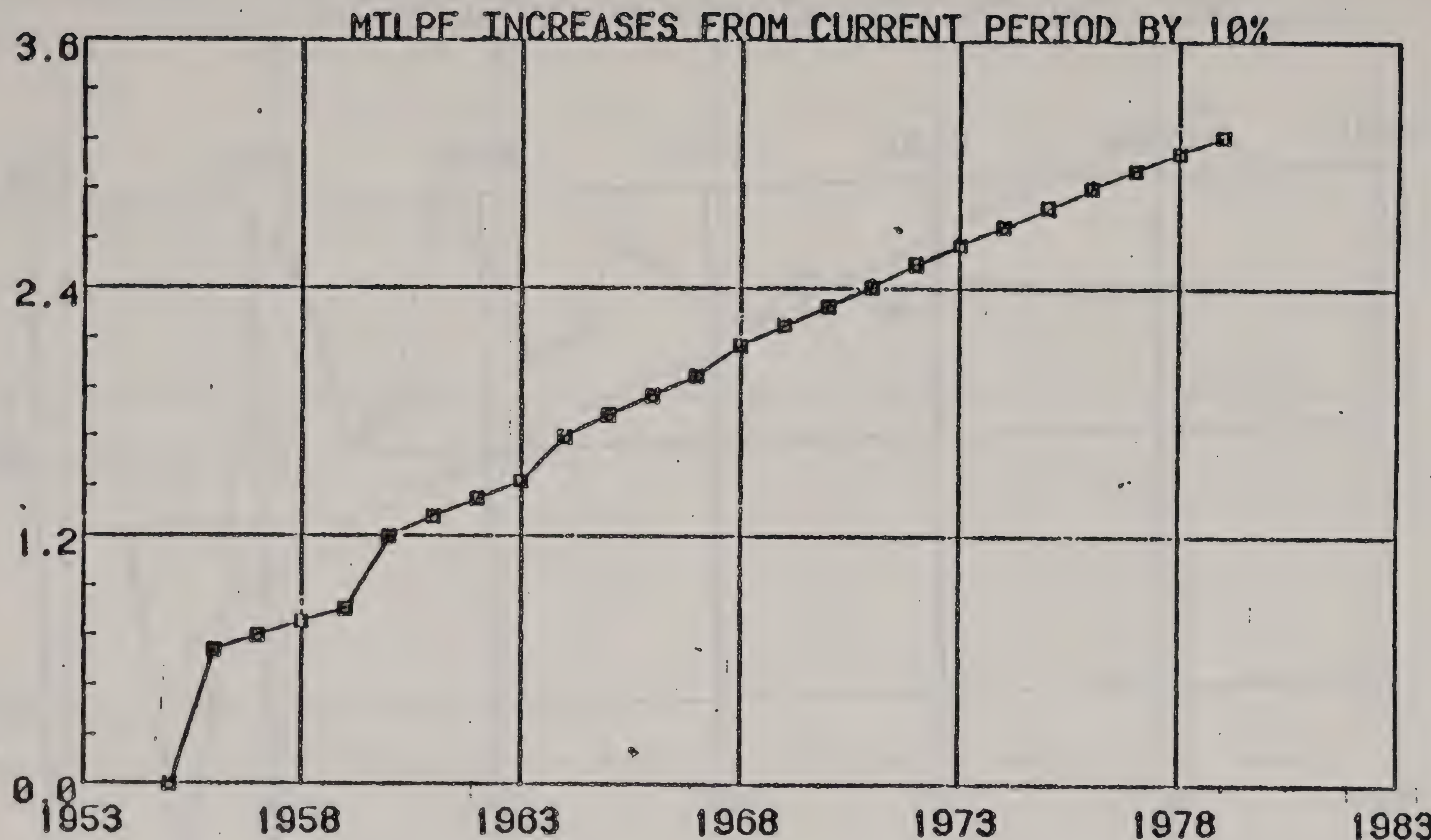
SYMBOL	SCALE	NAME
□	1	CUM.MULT_BEEAP



TIME BOUNDS; 1953 TO 1979

SYMBOL SCALE NAME

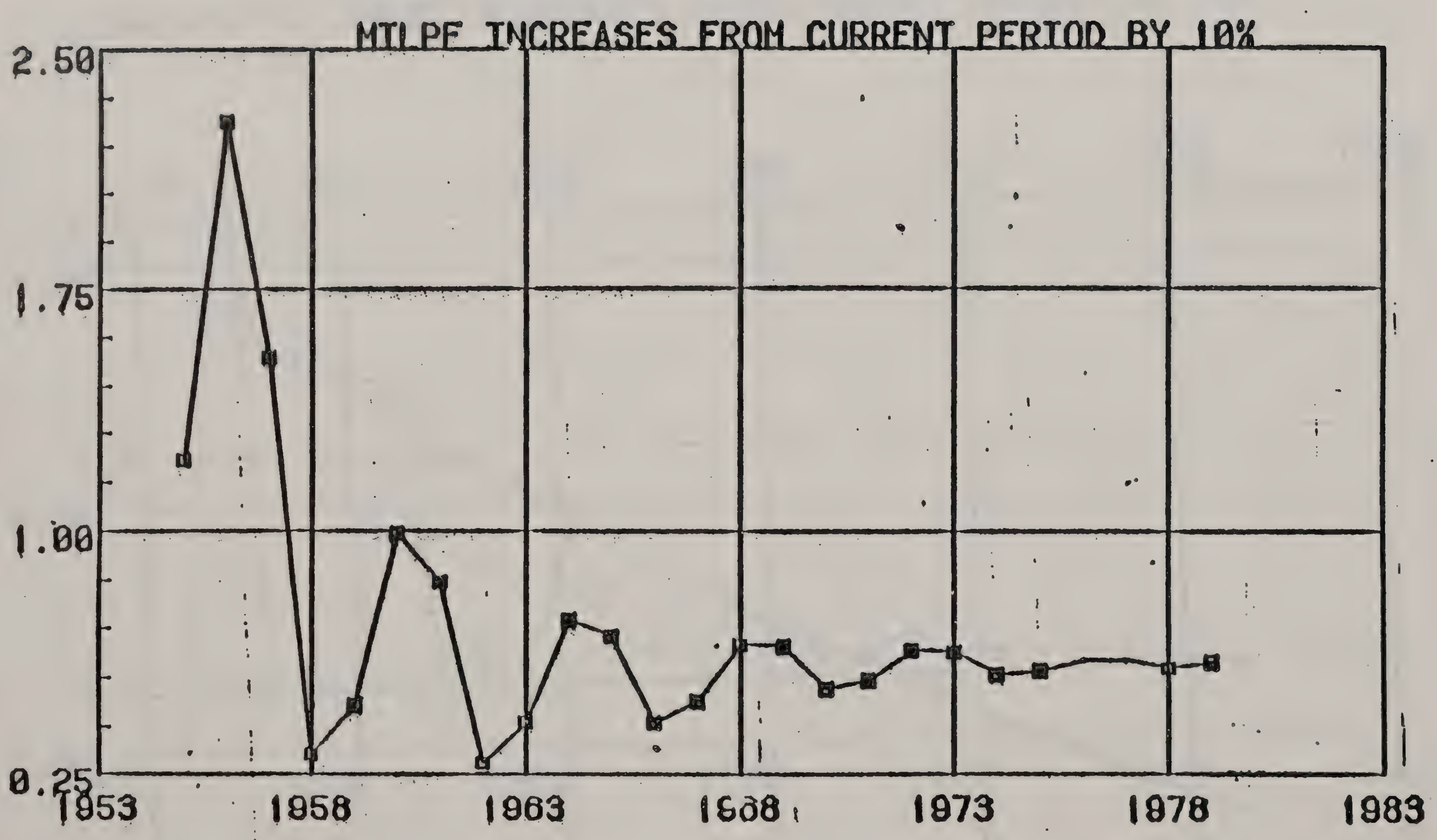
¤ #1 IMP.MULT_COWSNMC



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

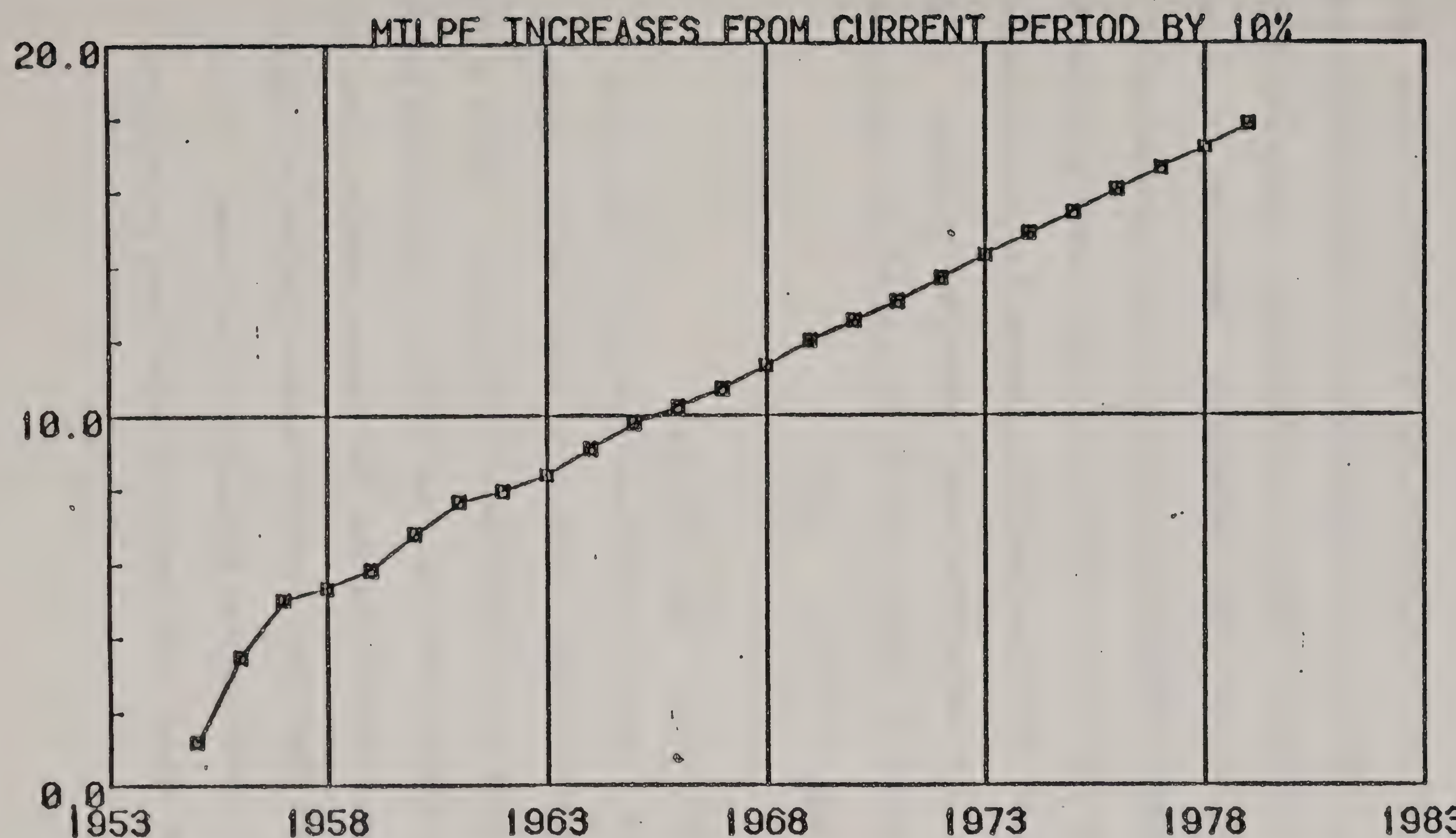
□ #1 CUM.MULT_COWSNMC



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

□ #1 TMP.MULT.MTLAP2



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

□ #1 CUM.MULT_MILAP2

Since in the beef and dairy supply model producer prices are assumed to be exogenous variables, it should be interesting to analyze the implications of changing these prices on the adjusting patterns of the endogenous variables towards the steady state equilibrium and on the nature of the steady state equilibrium. There are four beef prices affecting the beef and dairy model: the price of steers, of choice feeder cattle, of utility cows and of veal. Because of the high degree of substitutibility in the consumer demand of beef of different qualities, it is very likely that the above mentioned prices are highly correlated. Therefore, it was decided to perform the dynamic analysis by changing all of these prices by the same proportion. It should be clear that in this case there is no meaning to the term "multiplier" since the resulting changes in the endogenous variables cannot be related to a change in a single exogenous variable. In the tables of the Appendix to section III the meaning of the headings are:

$$\text{Delta } y_{t+n} = A^n B\, \Delta x_t \qquad n \geq 0$$

$$\text{Cum. Delta } y_{t+n} = \left(\sum_{i=0}^{n} A^i B\right) \Delta x_t$$

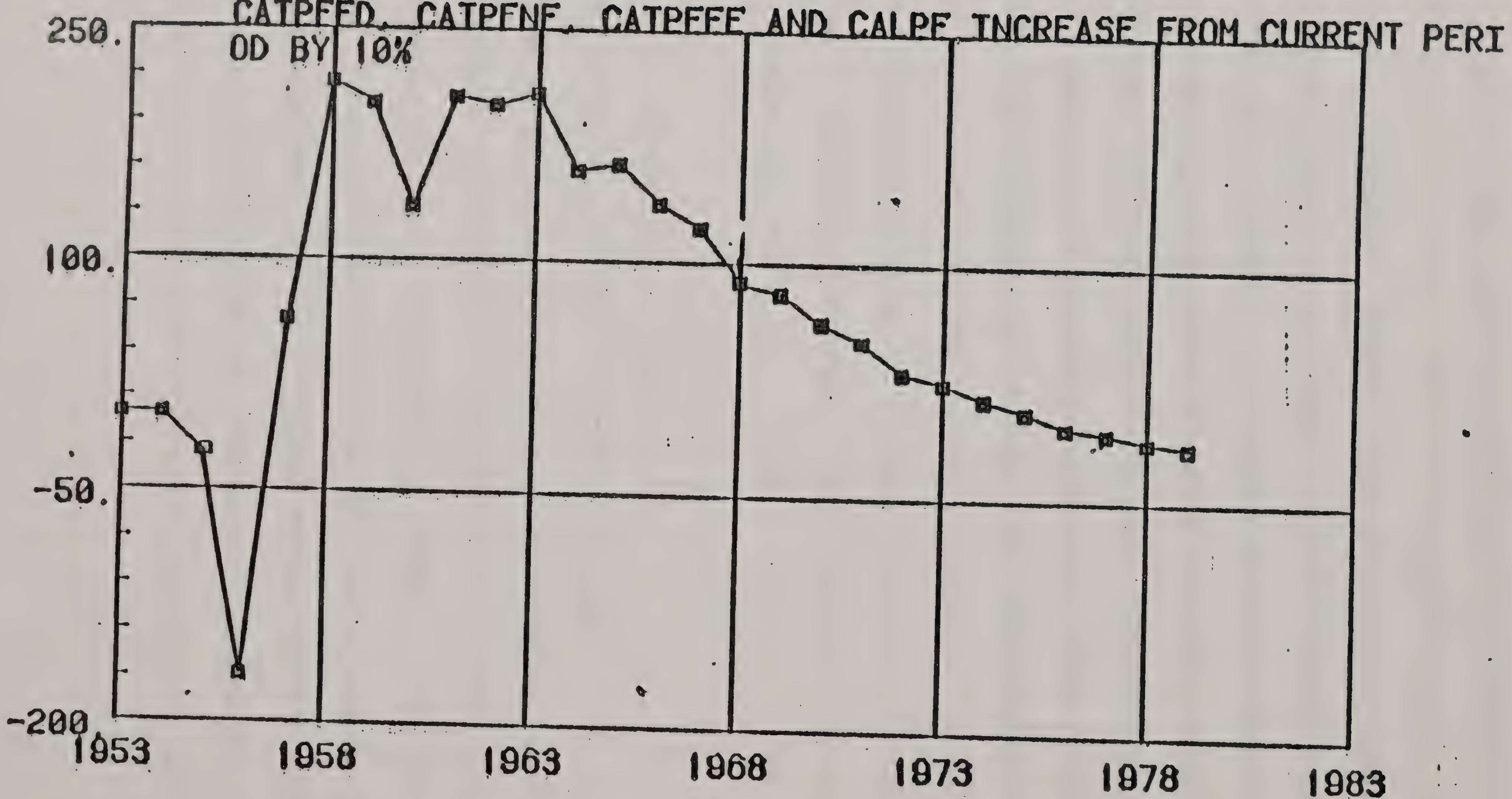
where Δx_t stand for a vector of pertinent changes in beef prices.

As far as fed and non-fed slaughter is concerned the adjustment patterns towards convergence are diametrically opposed. While initially non-fed cattle slaughtered declines, the numbers of fed steers and heifers increase. The reason again being that for non-fed cattle, their capital value increases more than their foregone revenue for not selling now (capital cost) and therefore less animals are slaughtered. On the other hand, as beef prices increase there is not much to gain from

postponing slaughter and therefore slaughter is increased. Eventually the adjustment pattern reverses itself. As a result, in the long-run more fed and less non-fed animals will be slaughtered. The implication for beef production is obvious.

An additional outcome of a general increase in the price of beef is that in the long-run less heifers are added to the dairy herd. As a result, the dairy herd in the long-run will decline and the yield of milk will increase. The total effect on milk production will be negative.

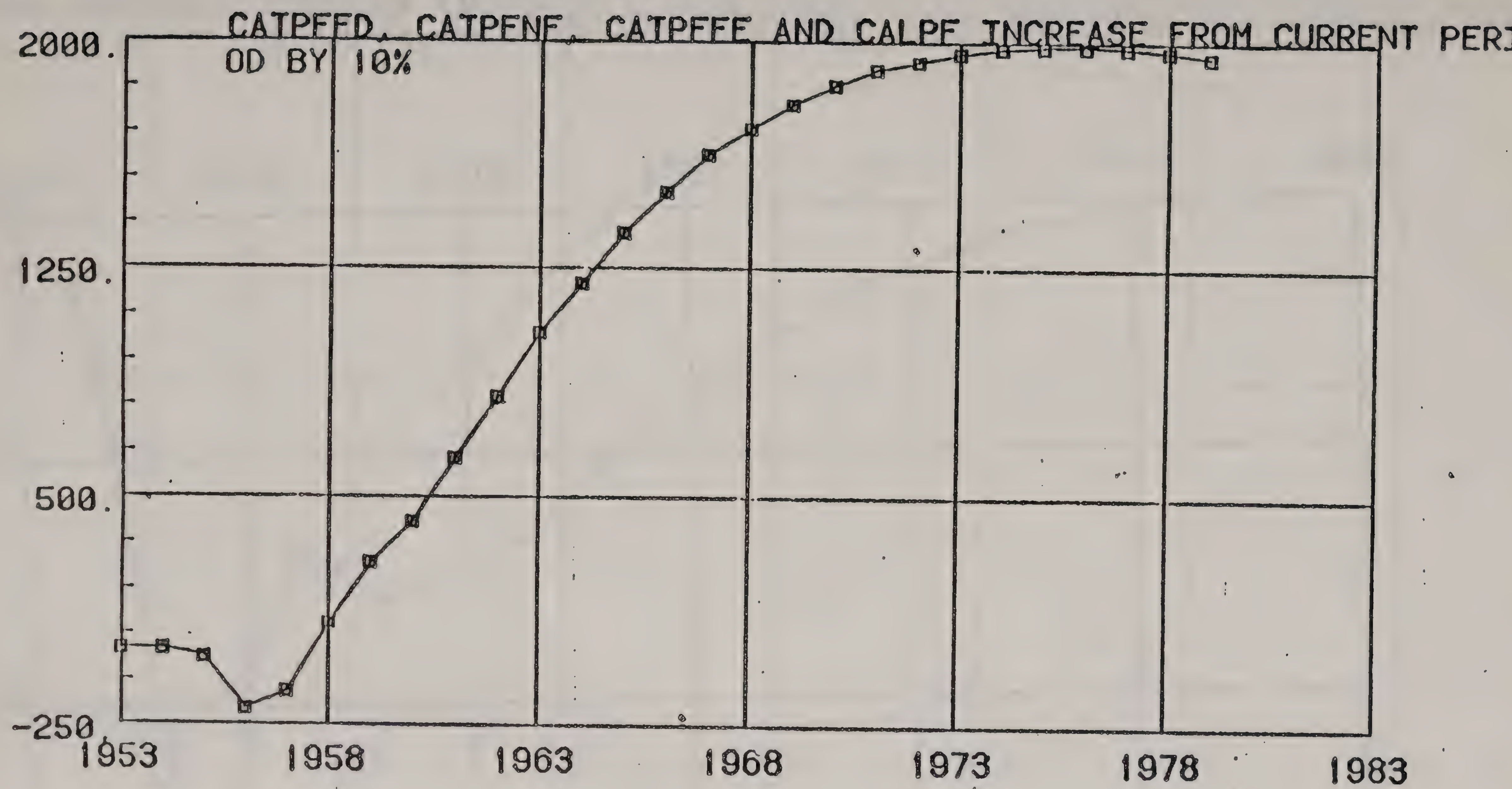
Some of these results are shown graphically. The detailed computations appear in the tables shown in the Appendix to this section.



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

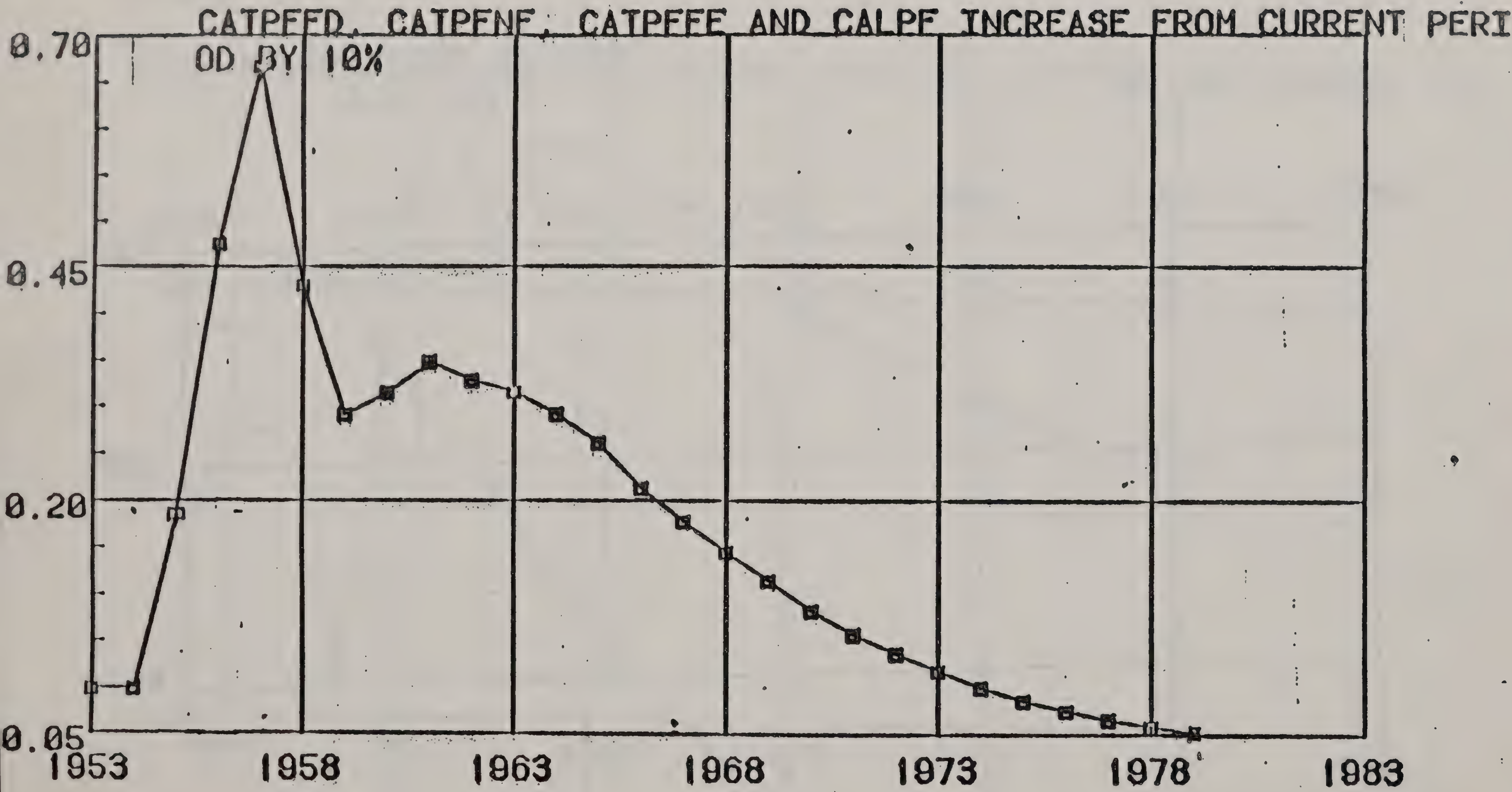
□ #1 DELTA_BEFAP



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

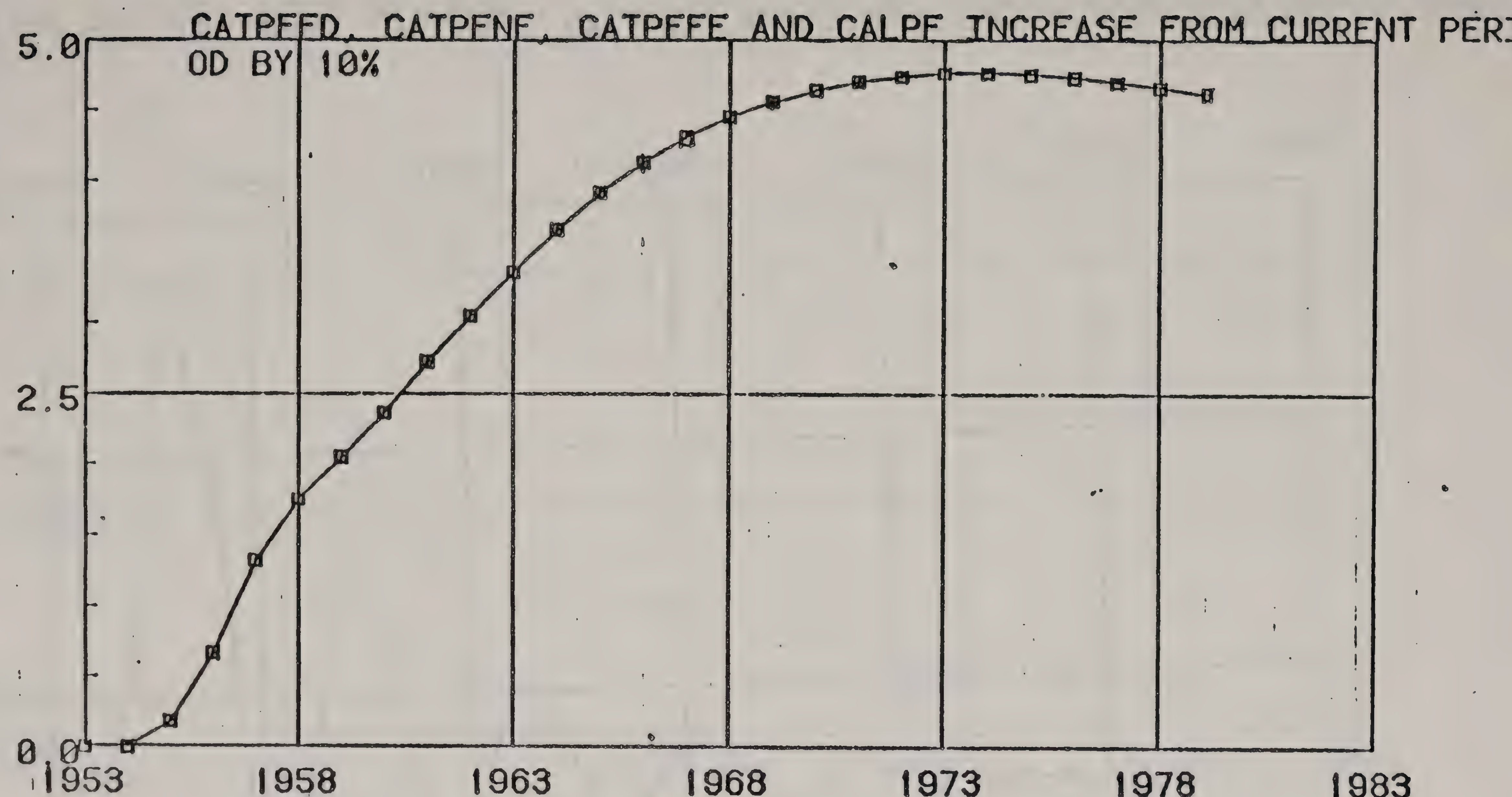
" #1 CUM_DELTA_DELAP



TIME BOUNDS: 1953 TO 1979

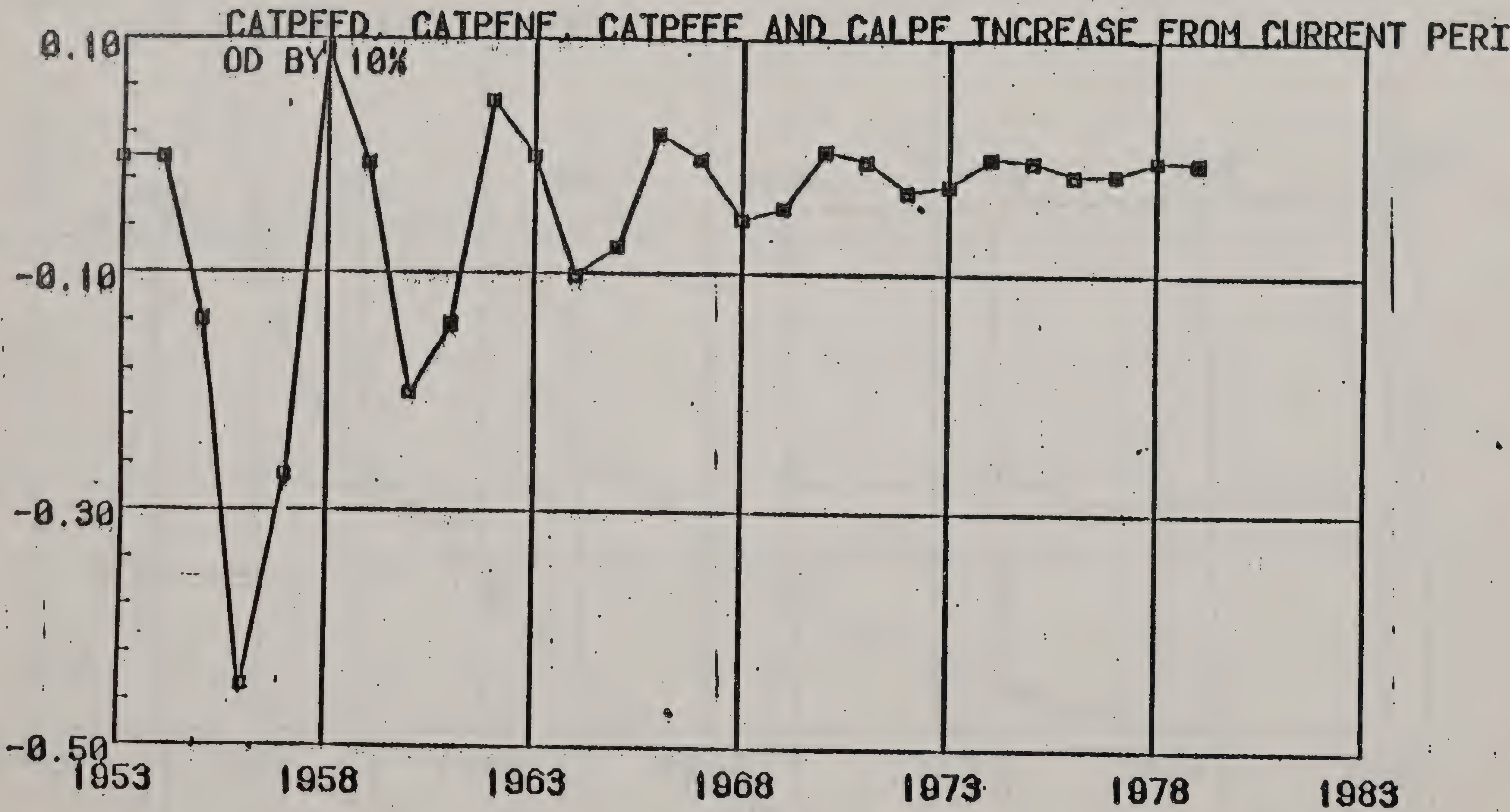
SYMBOL SCALE NAME

◻ #1 DELTA_SAUKSFD



TIME BOUNDS: 1953 TO 1979

SYMBOL	SCALE	NAME
□	#1	CUM_DELTA_SAHKSFD

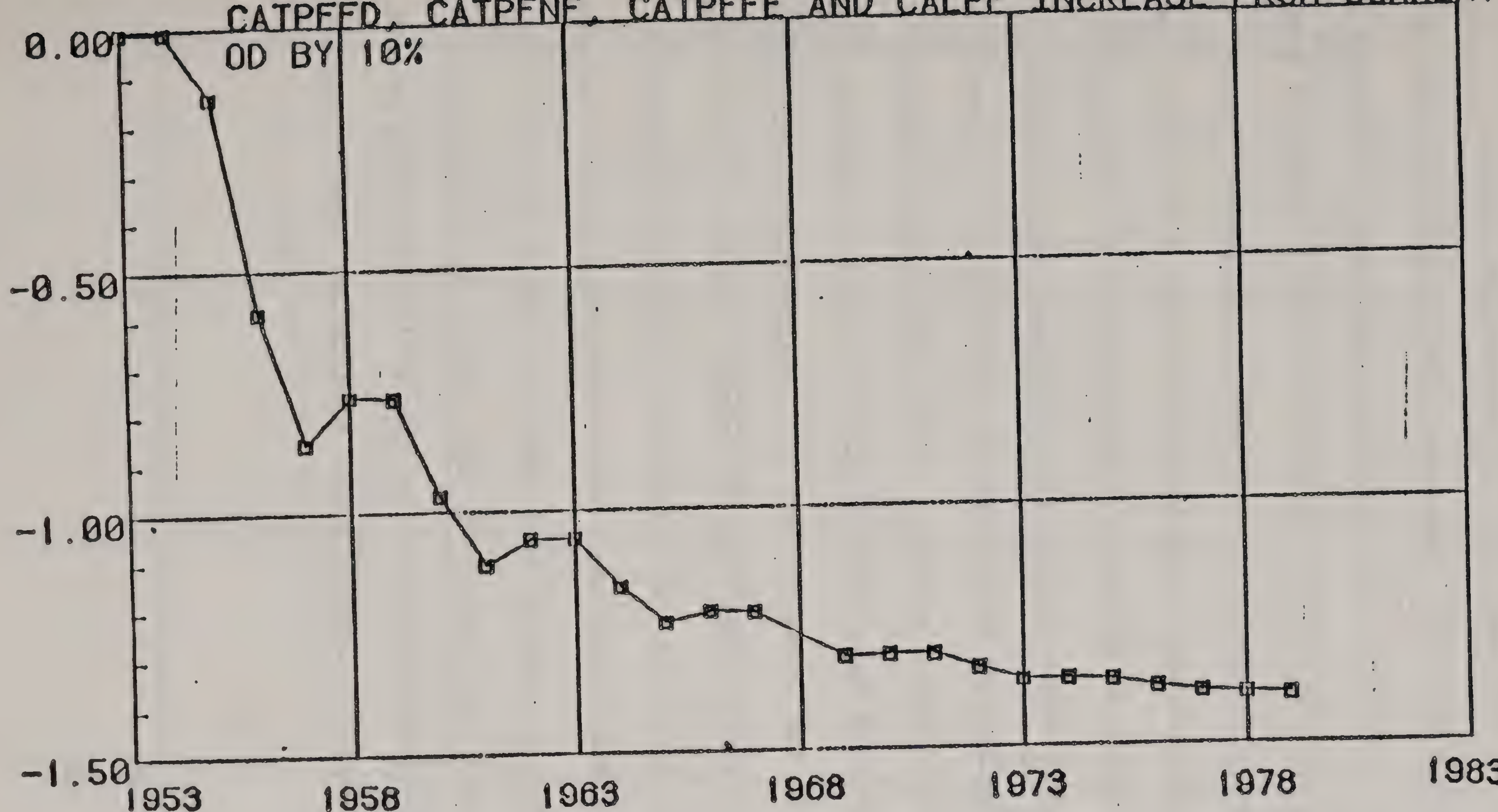


TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME

□ #1 DELTA MILAP2

CATPFFD, CATPFNF, CATPFFE AND CALPF INCREASE FROM CURRENT PERIOD BY 10%



TIME BOUNDS: 1953 TO 1979

SYMBOL SCALE NAME
□ #1 CUM_DELTA_MILAP2

III.2 Dynamic Characteristics of the Pork Component

In this component, the dynamic characteristics were tested with respect to two exogenous shocks: a) A 10% increase in the price of corn; b) A 10% increase in the farm price of barrows and gilts.

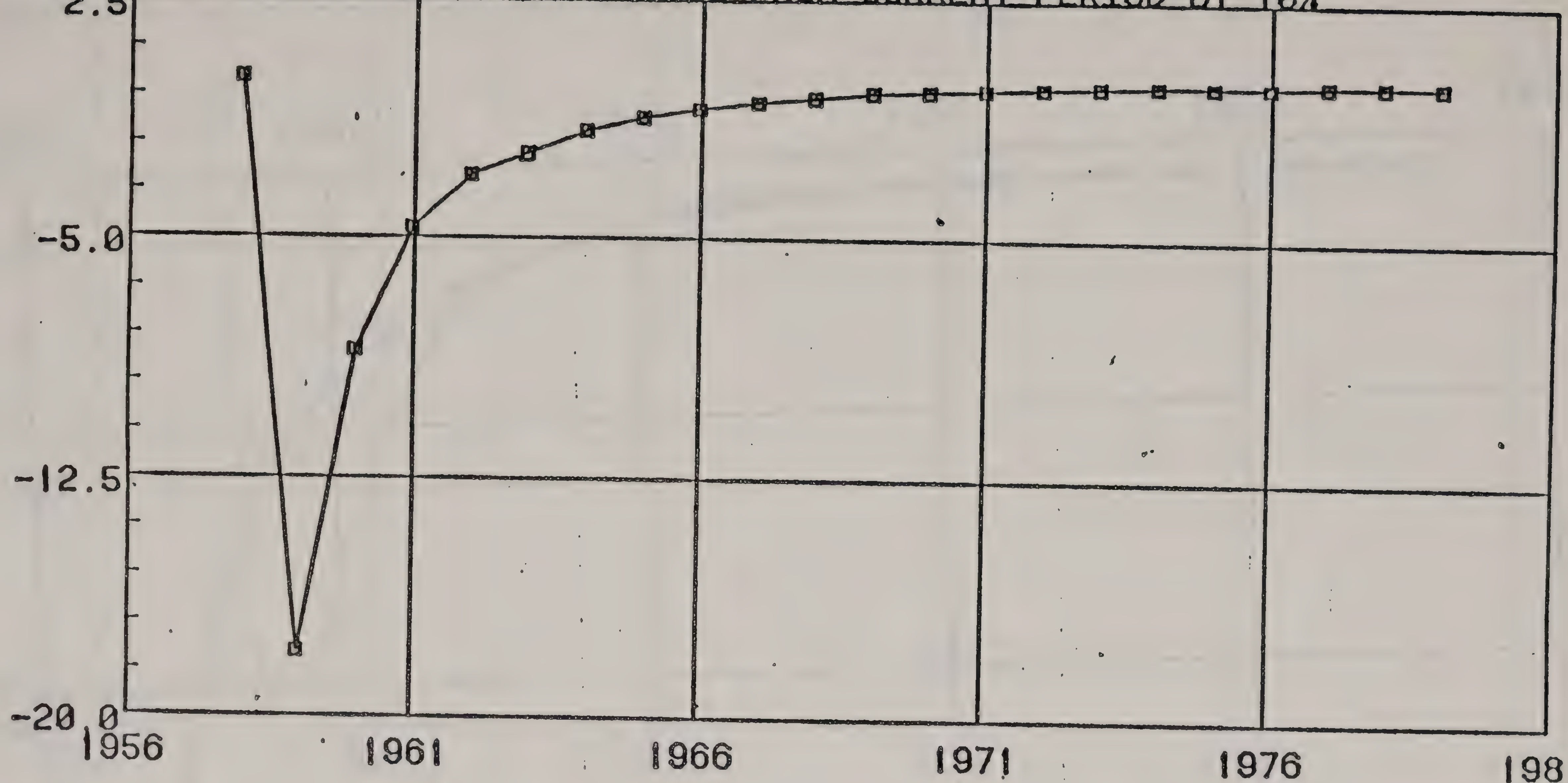
Unlike the beef and dairy component, the production cycle in pork is much shorter. Therefore, the recursive dependency on younger age cohorts is not a constraint in an annual pork supply model and does not affect the dynamic adjustments of the model to exogenous shocks. It follows that the adjustment mechanism will be only affected by the process by which expected prices are generated and by the lagged endogenous variables which reflect the adjustment delays due to constraints not explicitly dealt with in the model. As a result, less complicated adjustment patterns in the endogenous variables should be expected from exogenous shocks to the pork component.

An increase in the price of corn will uniformally reduce slaughter and production since less pigs will be raised. On the other hand, an increase in the farm price of barrows and gilts will uninformily increase slaughter and production because more pigs will be raised.

The adjustment patterns as seen from the tables shown in the Appendix to section III under the heading of "imp. mult." do montonically vanish.

The detailed results are shown in the tables appearing in the Appendix to this section. Some of these results are also presently shown graphically.

CORPF INCREASES FROM CURRENT PERIOD BY 10%

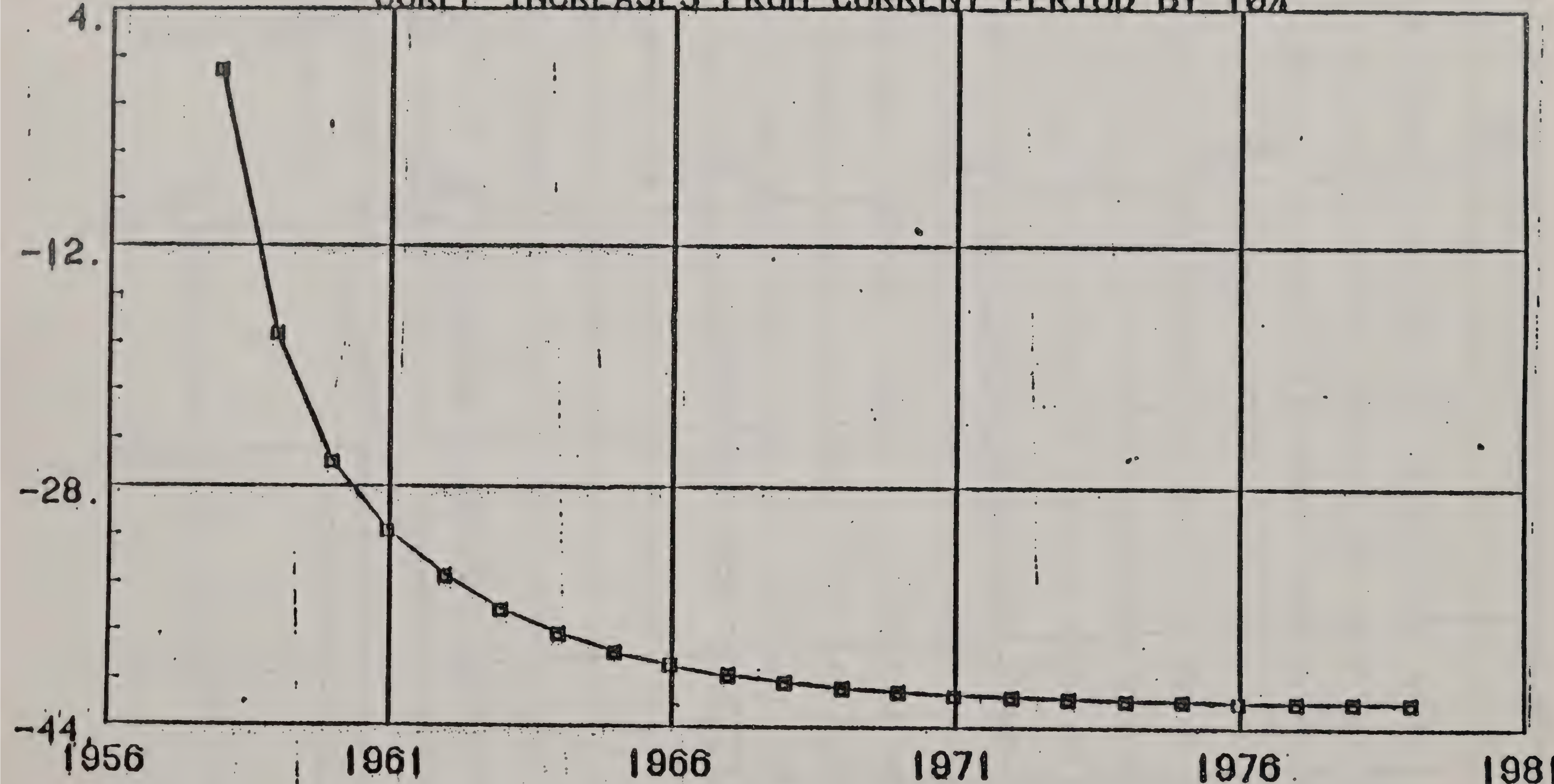


TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

□ #1 IMP.MULT_HOGSM

CORPE INCREASES FROM CURRENT PERIOD BY 10%

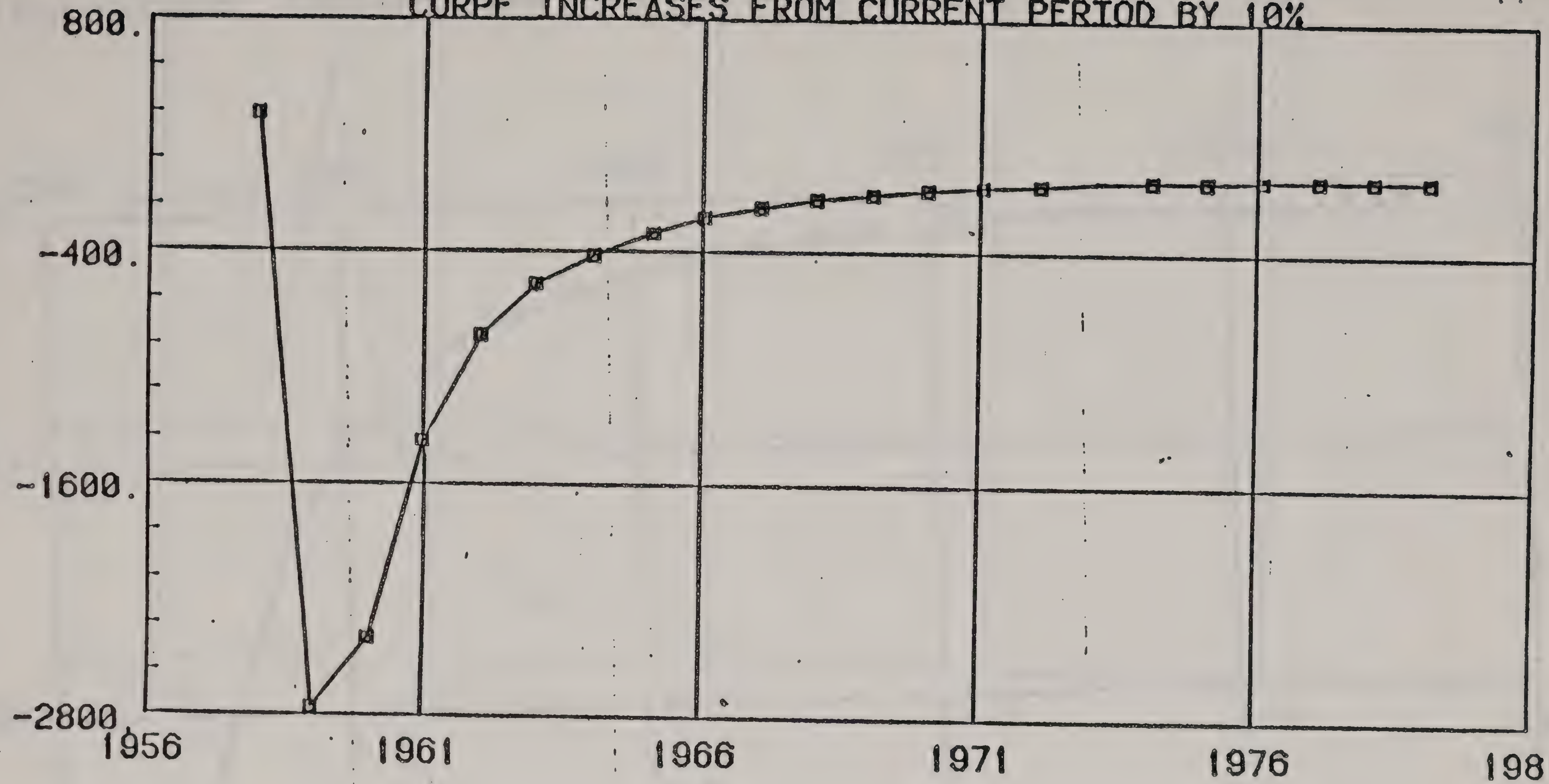


TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

⊡ #1 CUM.MULT.U00GM

CORPF INCREASES FROM CURRENT PERIOD BY 10%

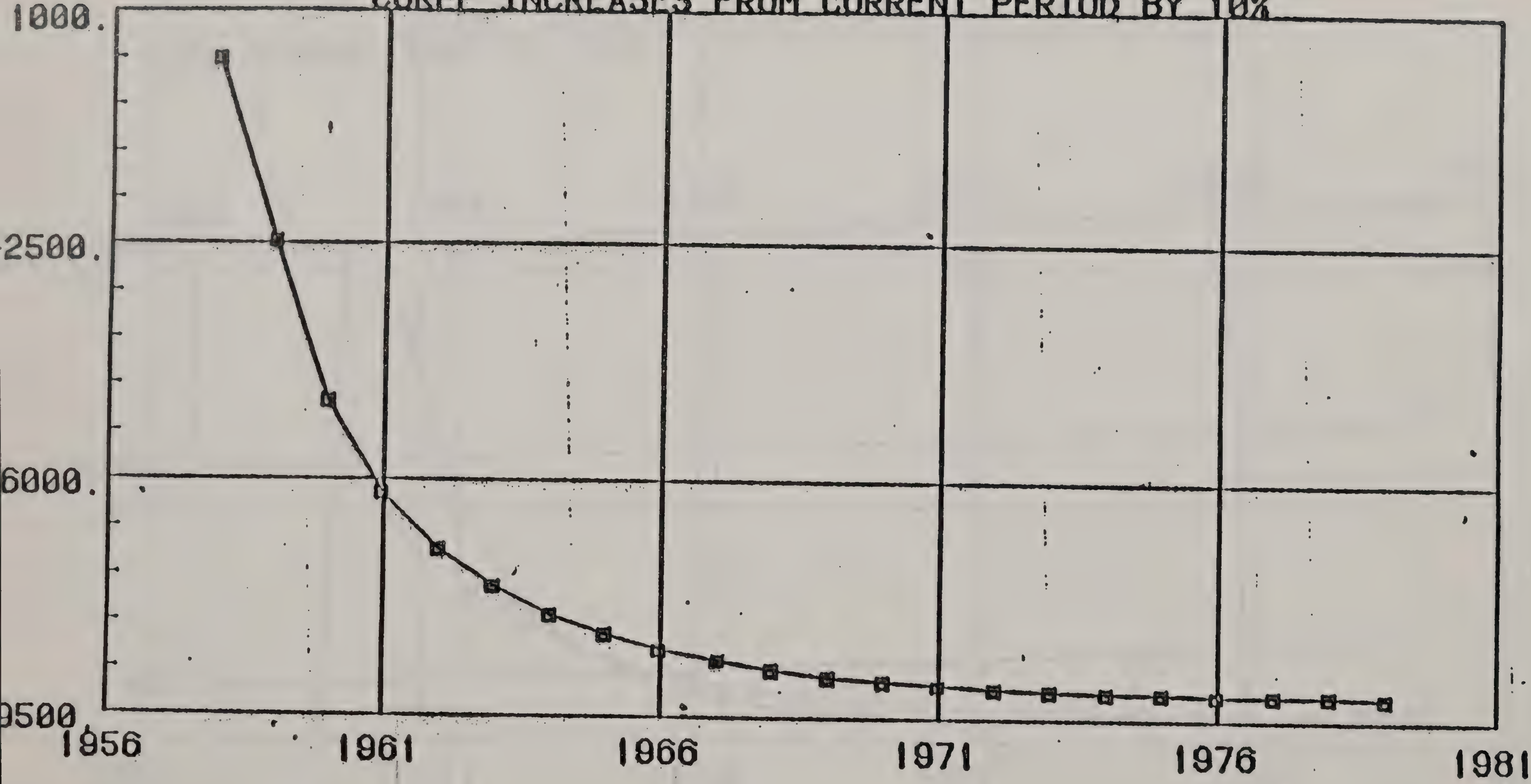


TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

□ #1 IMP.MULT_PORAP77

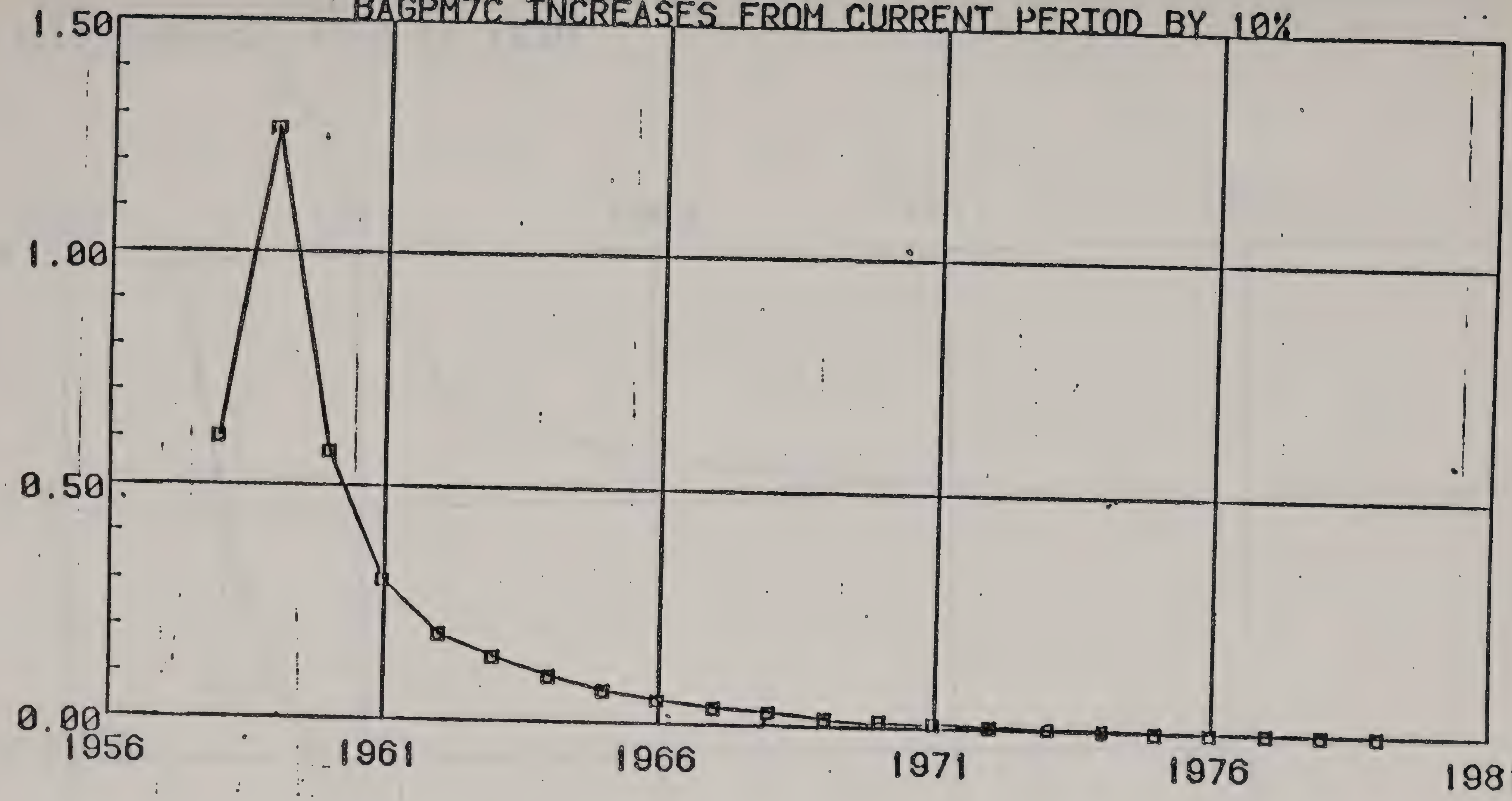
CORPF INCREASES FROM CURRENT PERIOD BY 10%



TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

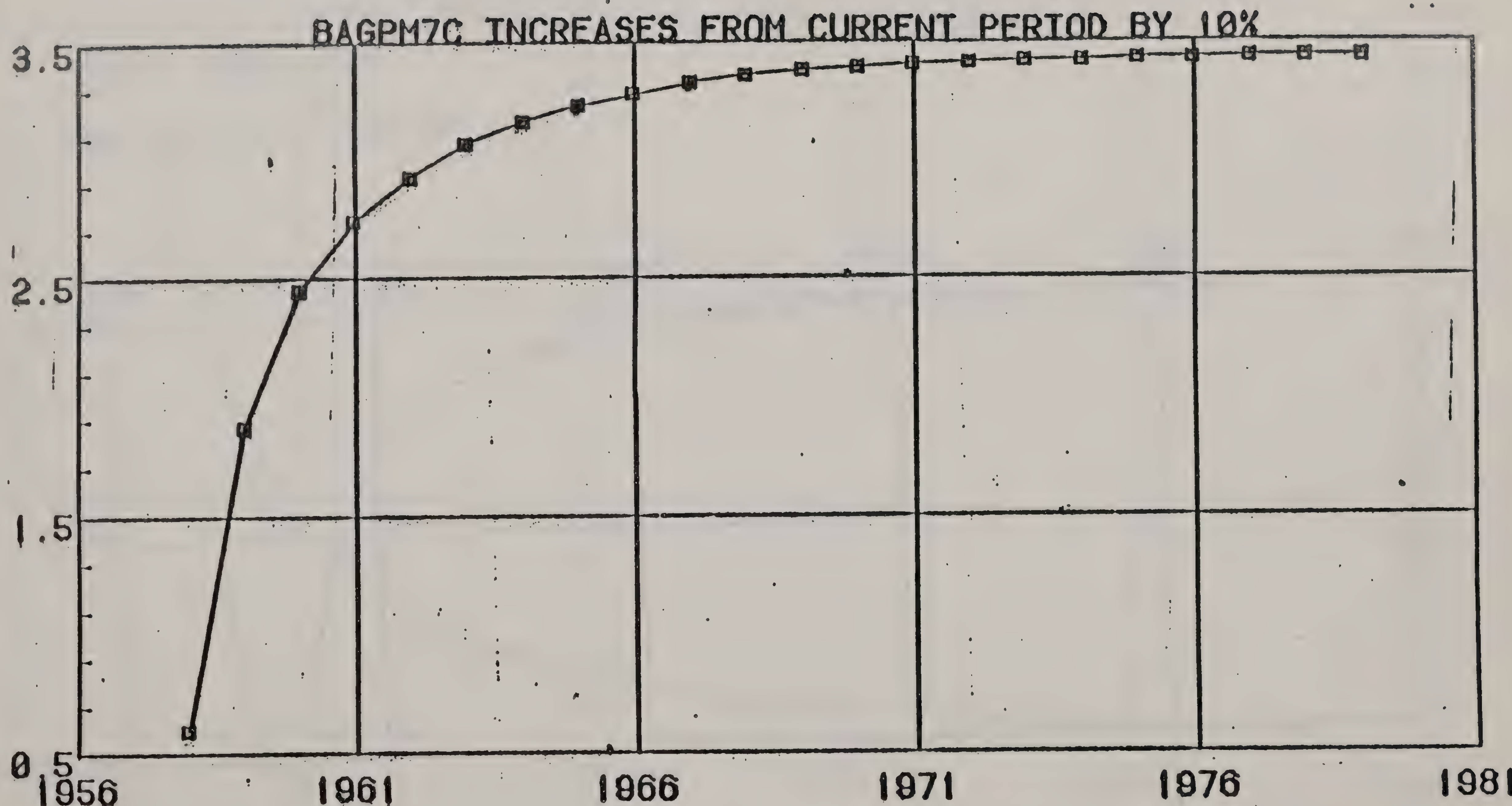
□ #1 CUM.MULT_PORAP77



TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

□ #1 IMP.MULT_HOGSM

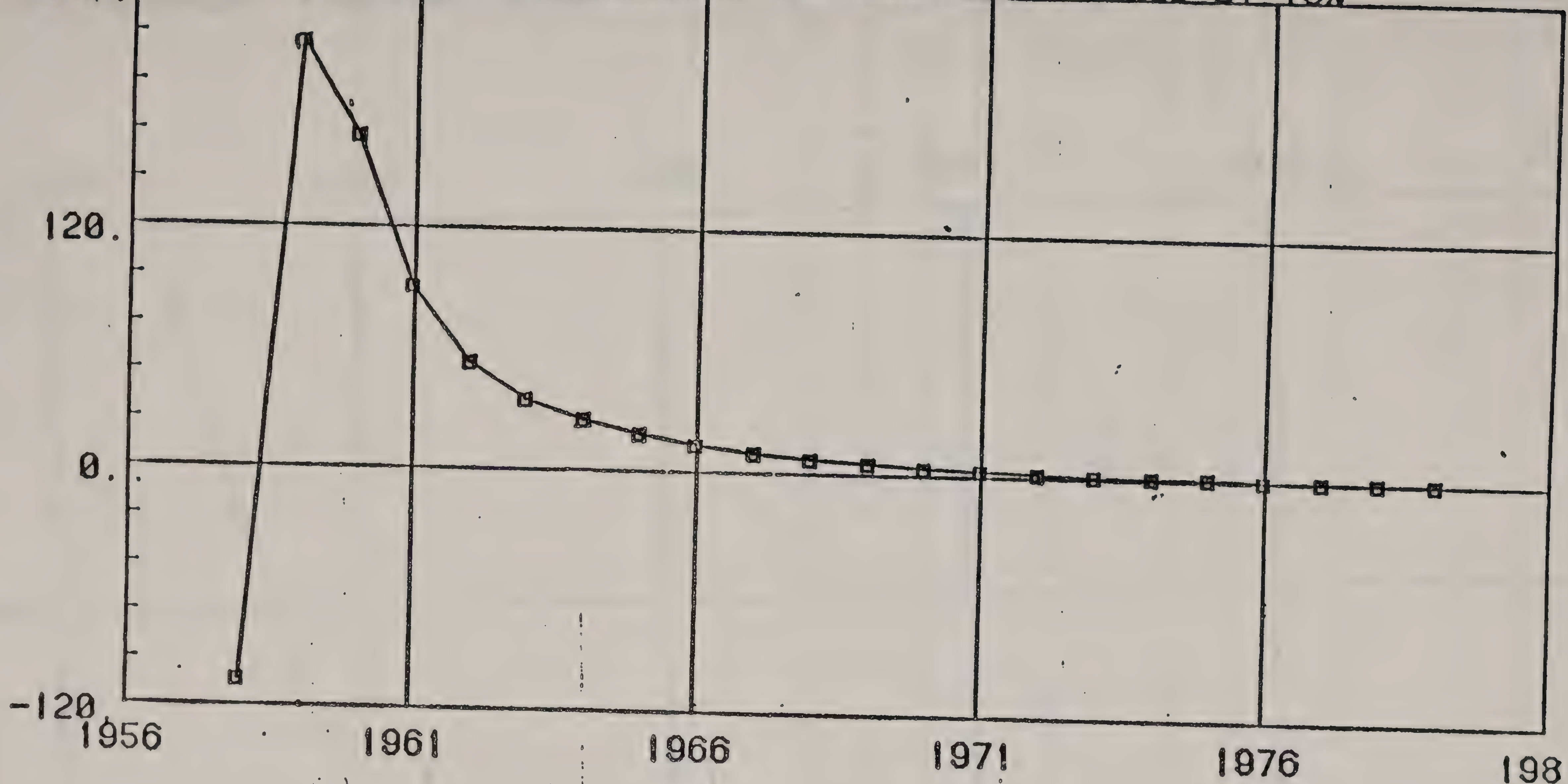


TIME BOUNDS, 1956 TO 1979

SYMBOL SCALE NAME

□ #1 CUM MULT HOGSM

BAGPM7C INCREASES FROM CURRENT PERIOD BY 10%

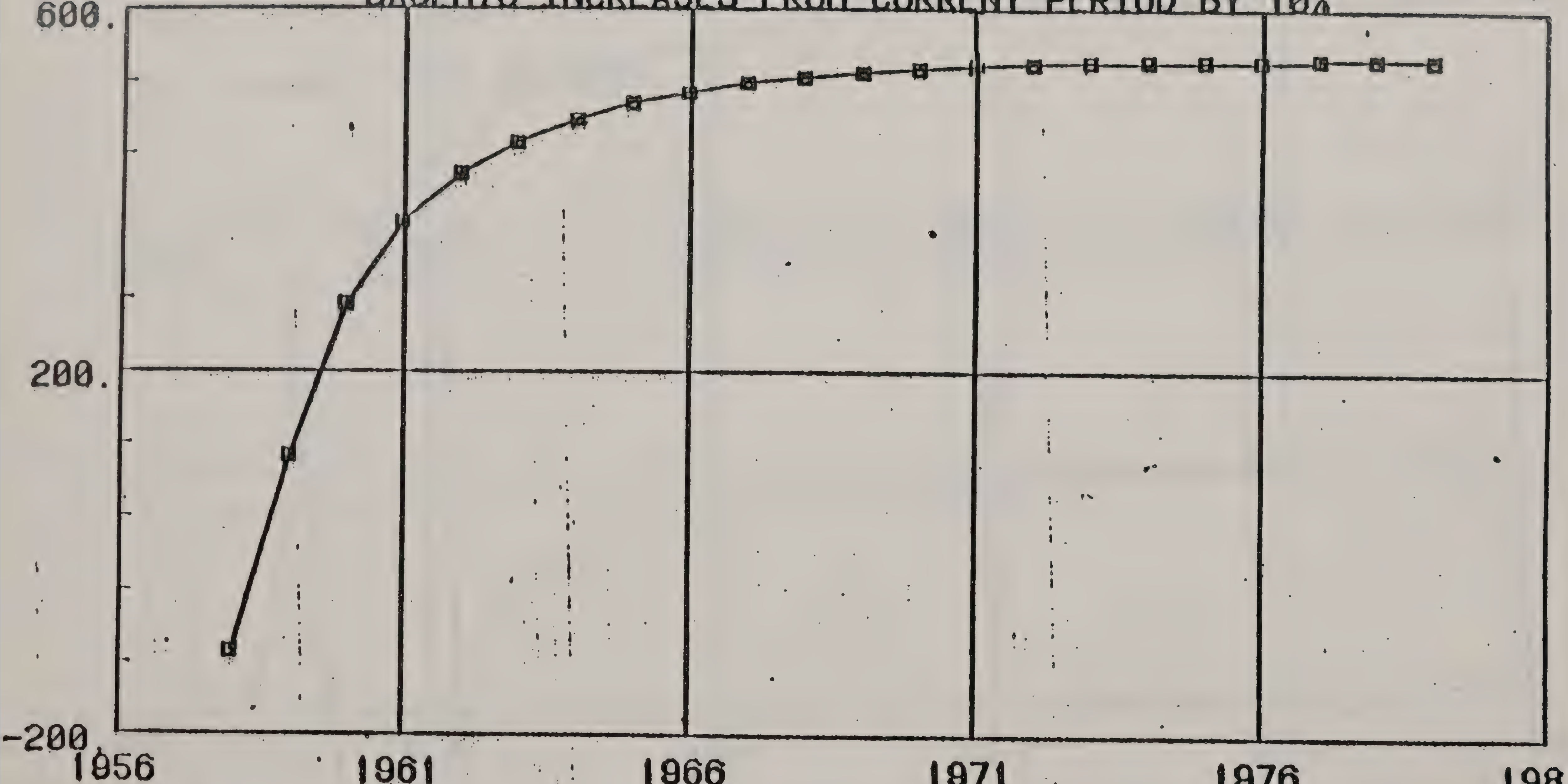


TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

□ #1 IMP.MULT_PORAP77

BAGPM7C INCREASES FROM CURRENT PERIOD BY 10%



TIME BOUNDS: 1956 TO 1979

SYMBOL SCALE NAME

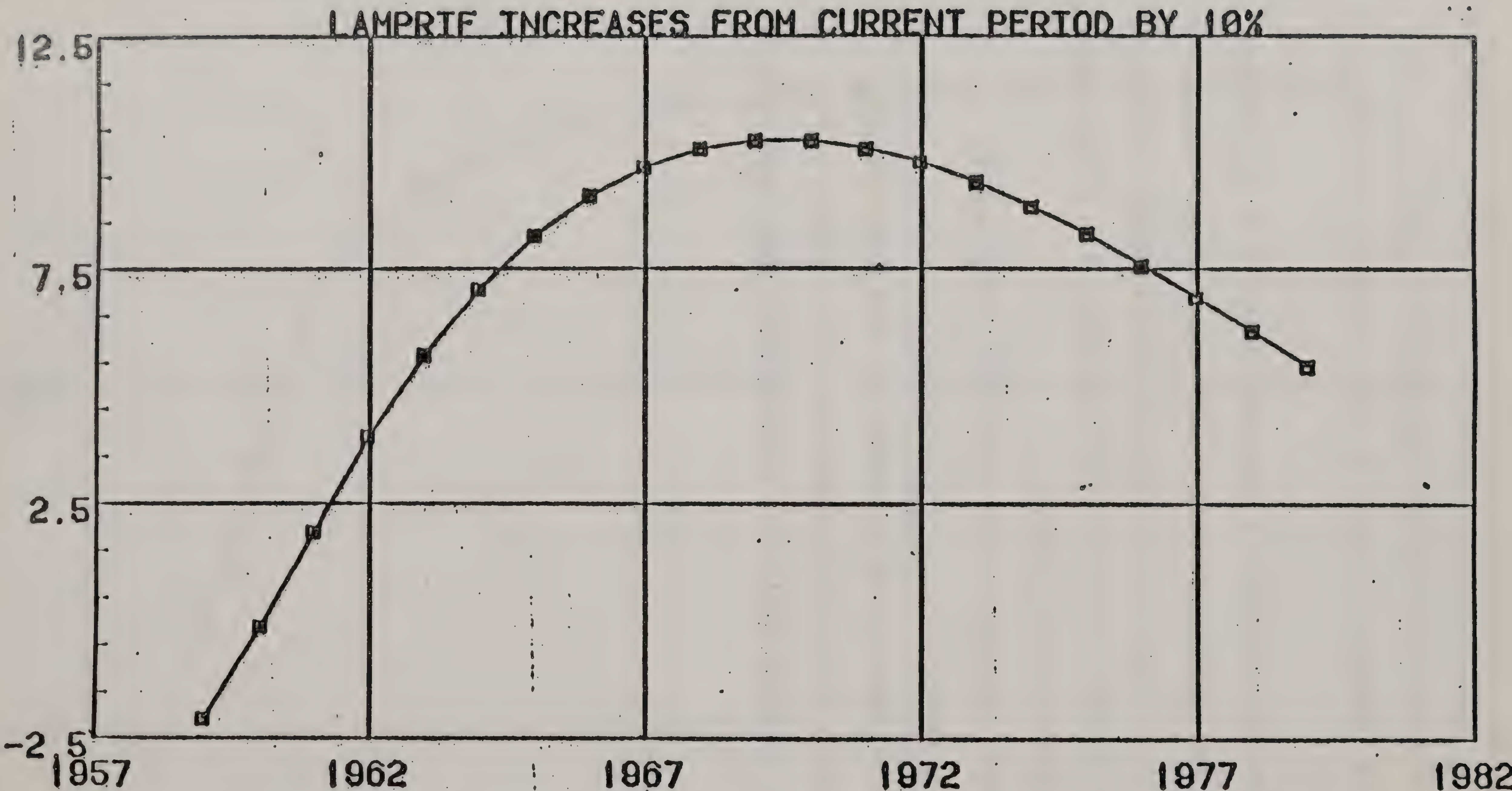
III.3 Dynamic Characteristics of the Lamb and Sheep Component

In this component only two perturbations were tested: a) A 10% increase in the farm price of lamb; b) A 10% increase in the farm price of wool.

The adjustment patterns to a stationary solution of all endogenous variables is very similar irrespective of the kind of perturbation. The impact of any of the analyzed perturbations increased monotonically and reaches a maximum 11 years after the perturbation is affected and then keeps declining till it vanishes.

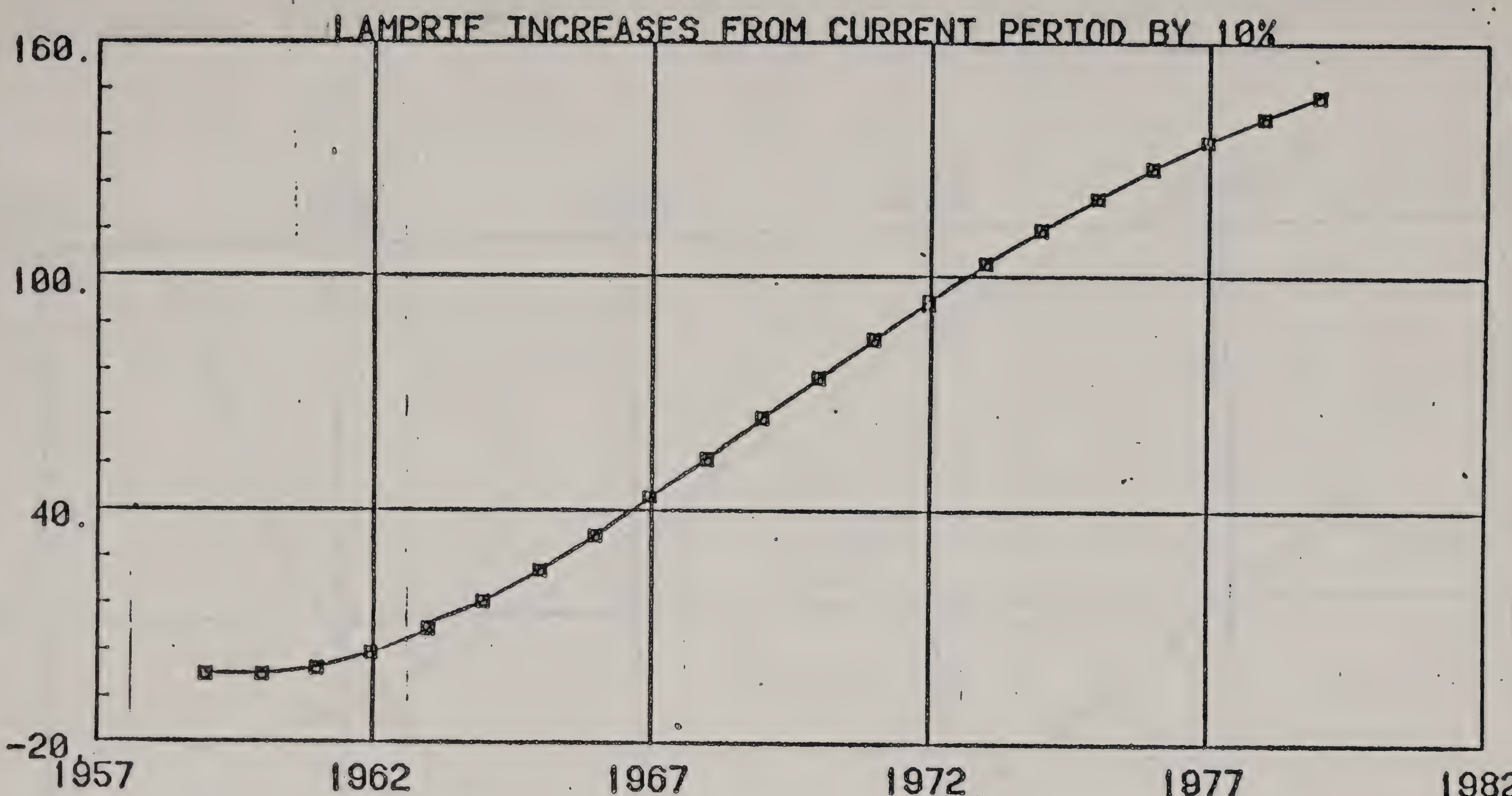
As a result, the cumulitative multipliers show a sigmoid dependency with time.

The detailed results from increasing the farm prices of lamb and wool are shown in the tables appearing in the Appendix to this section. Some of these results are also presently shown graphically.



TIME BOUNDS: 1957 TO 1979

SYMBOL SCALE NAME

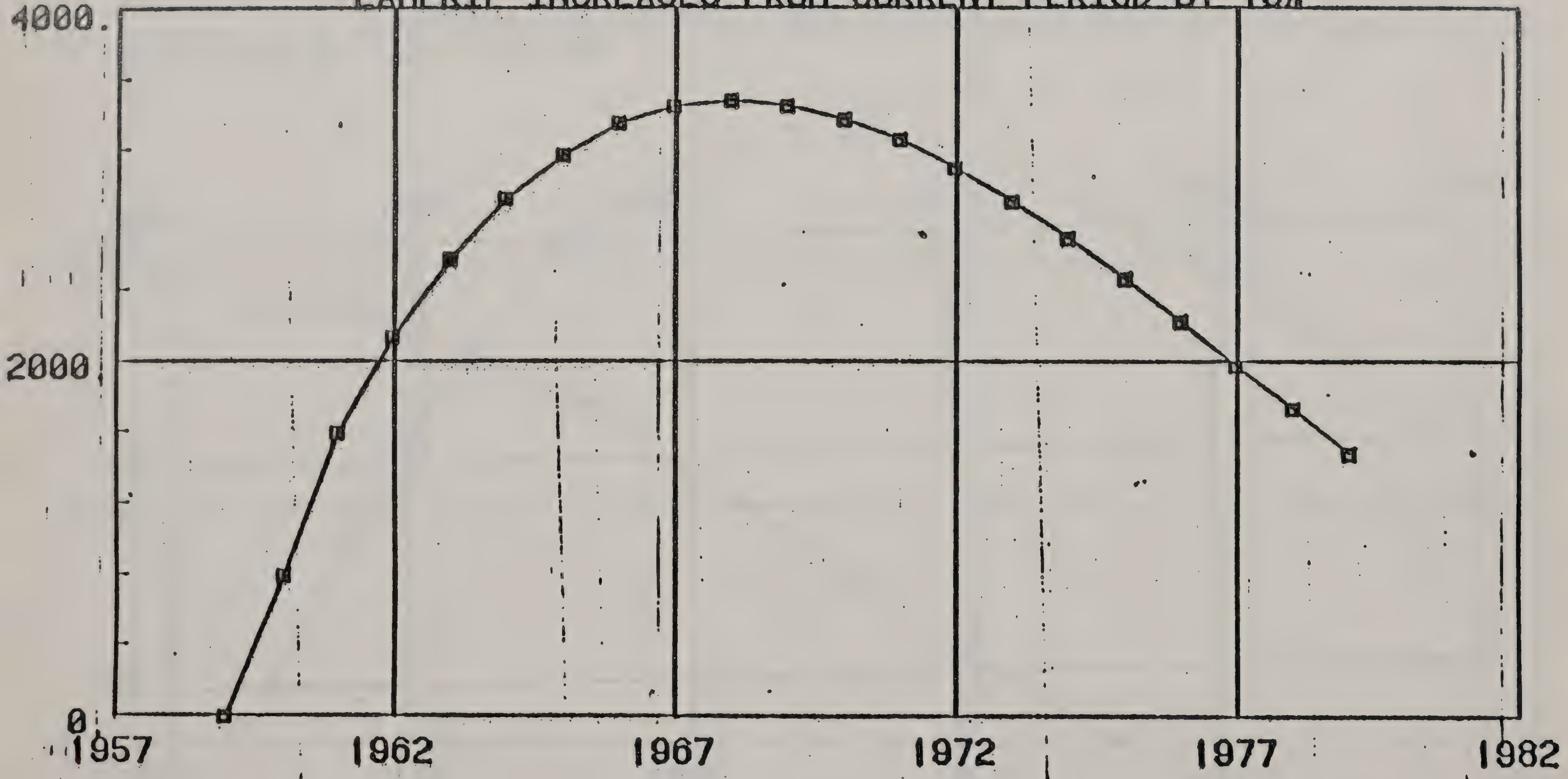


TIME BOUNDS: 1957 TO 1979

SYMBOL SCALE NAME

□ #1 CUM.MULT_LAMPROD

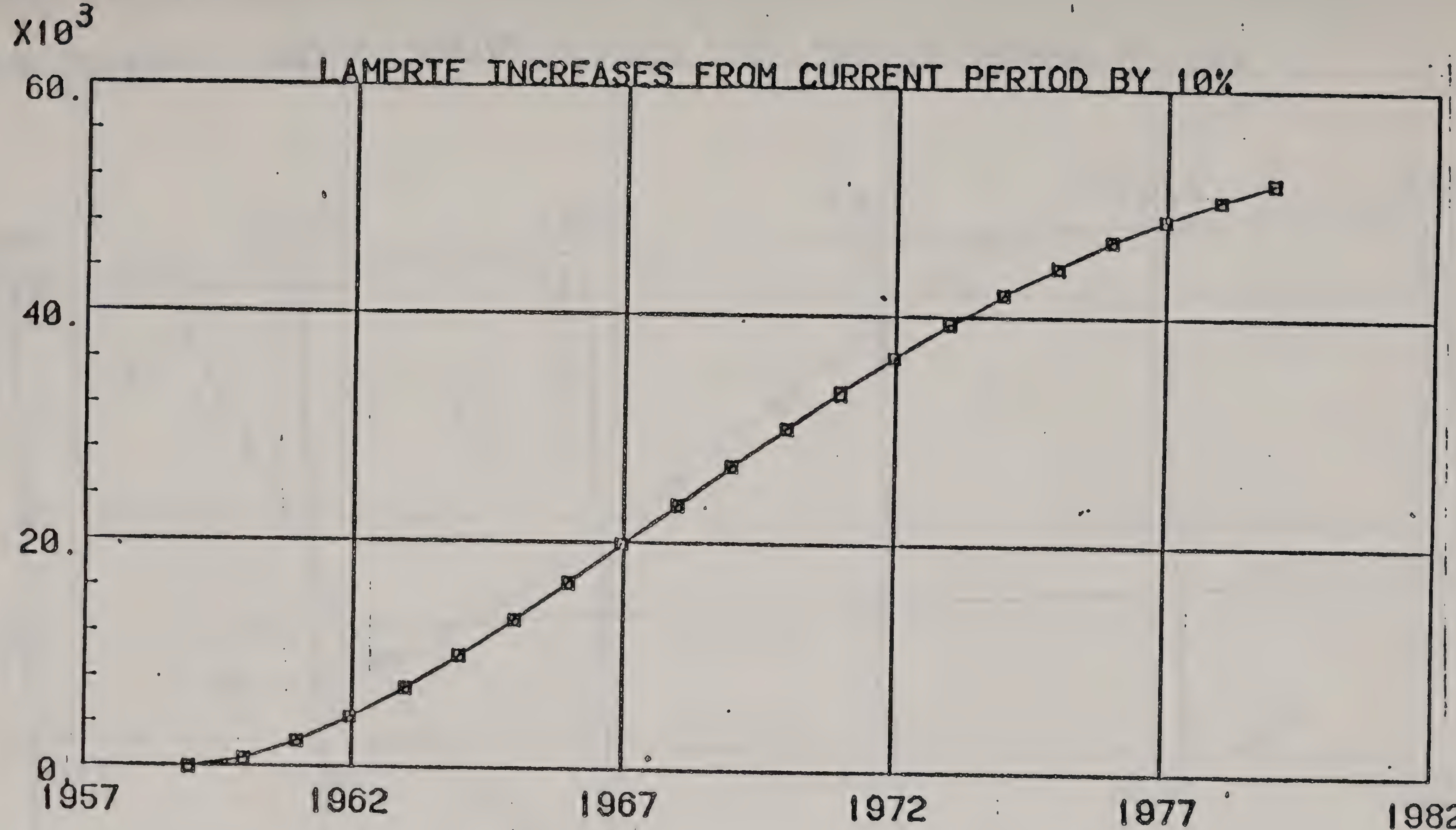
LAMPRIF INCREASES FROM CURRENT PERIOD BY 10%



TIME BOUNDS: 1957 TO 1979

SYMBOL SCALE NAME

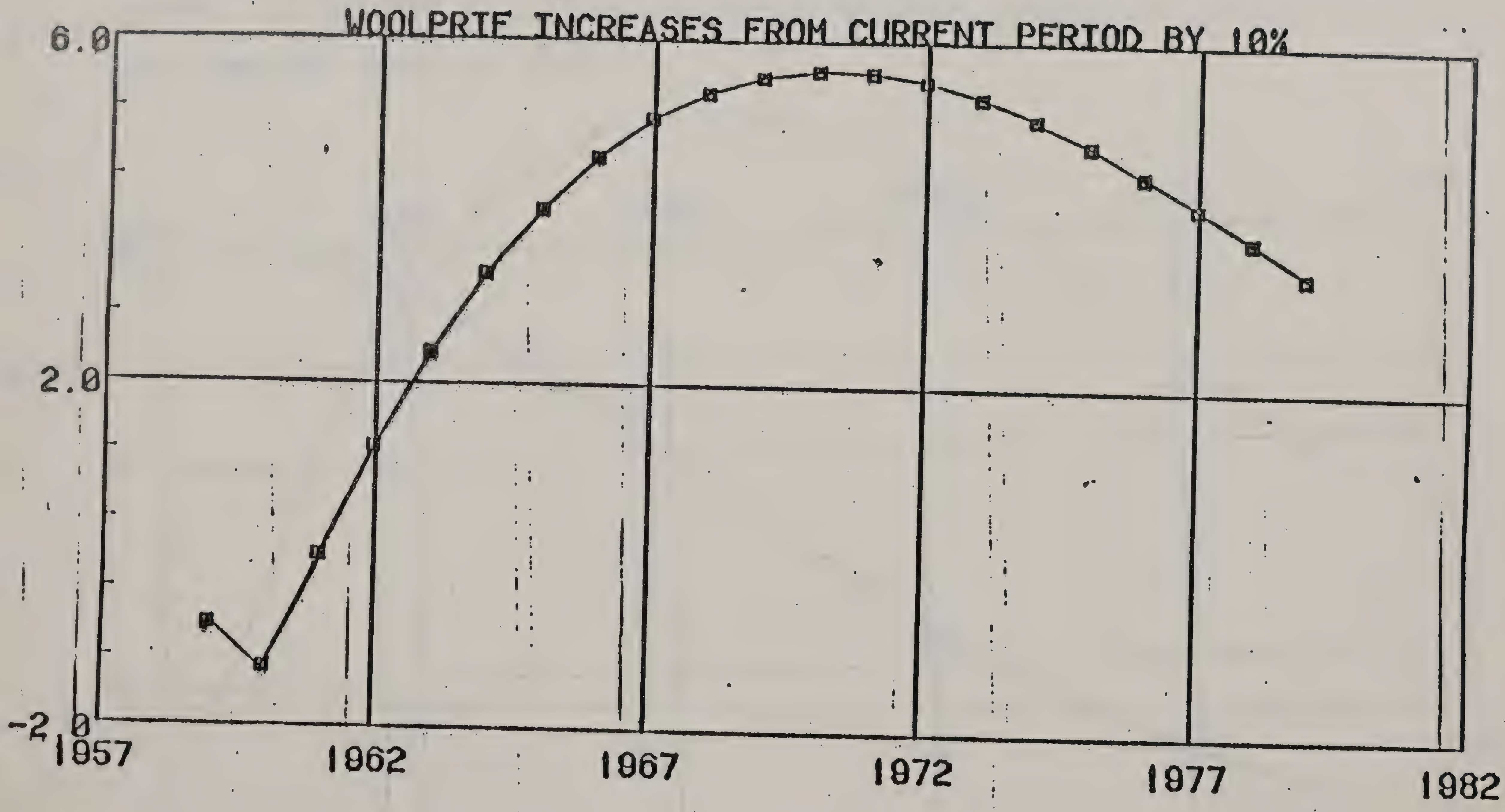
□ #1 IMP,MULT_WOOLPROD



TIME BOUNDS: 1957 TO 1979

SYMBOL SCALE NAME

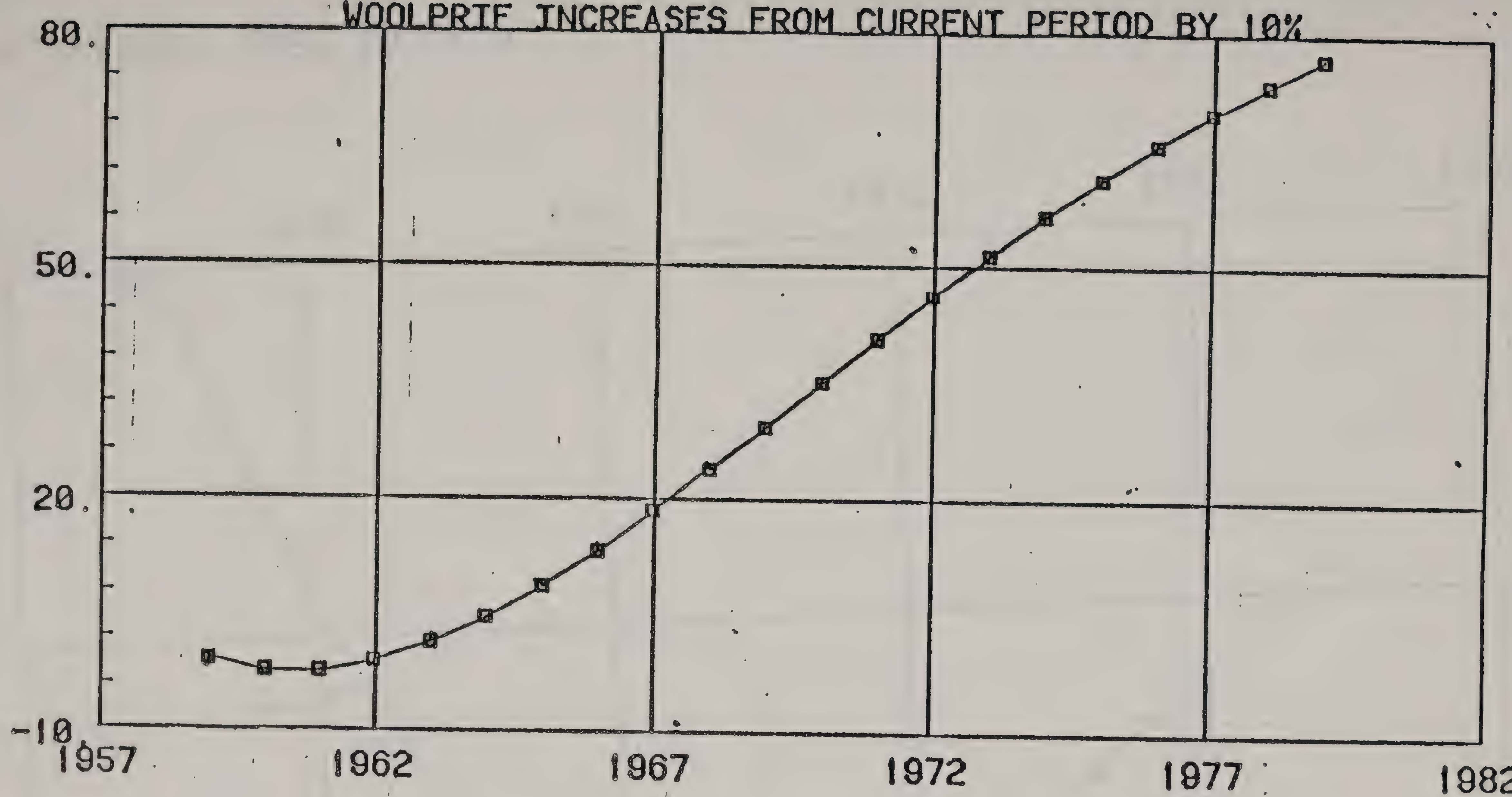
□ #1 CUM.MULT_WOOLPROD



TIME BOUNDS: 1957 TO 1979

SYMBOL SCALE NAME

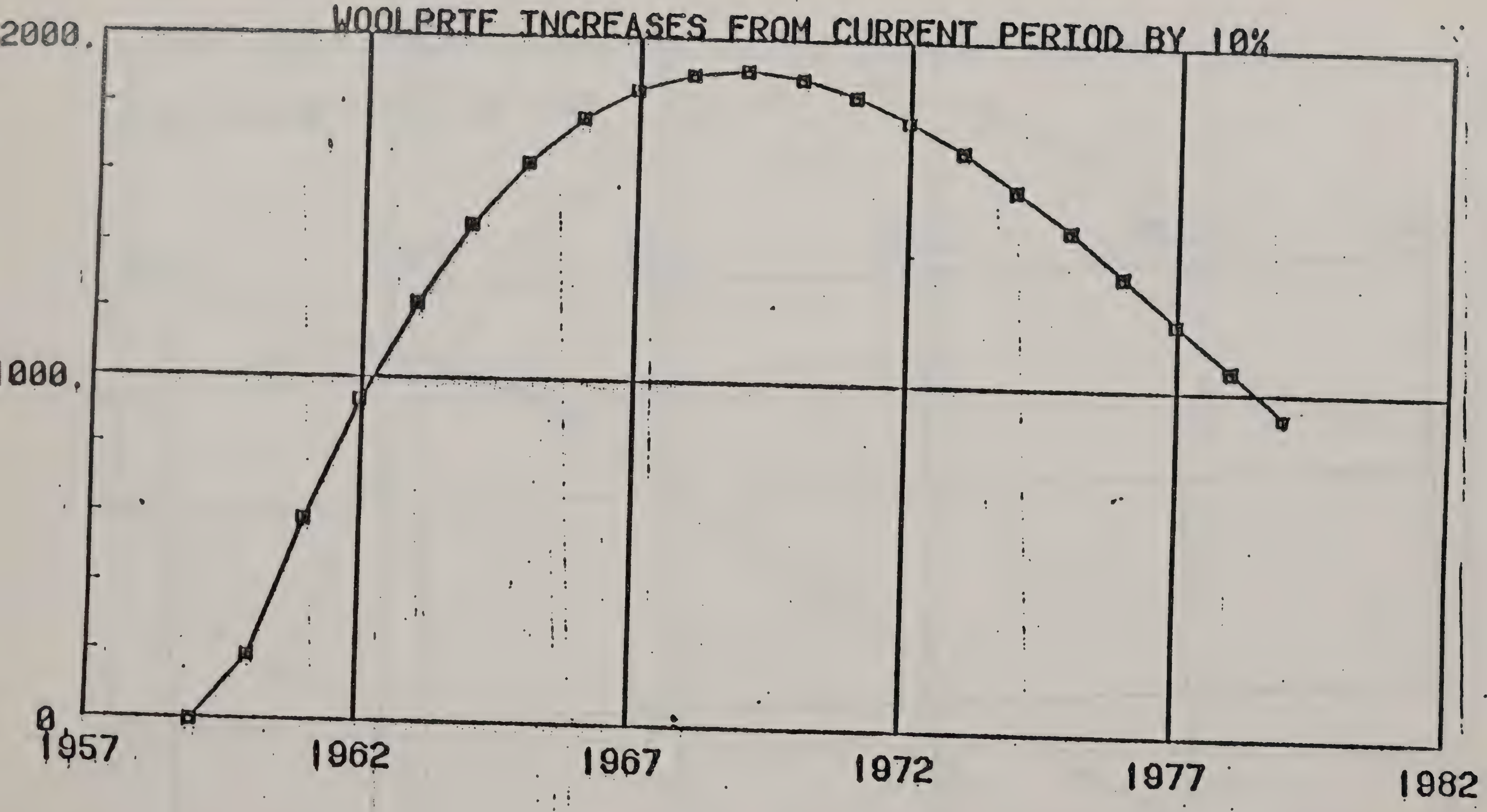
" #1 IMP.MULT LAMPROD



TIME BOUNDS: 1957 TO 1979

SYMBOL SCALE NAME

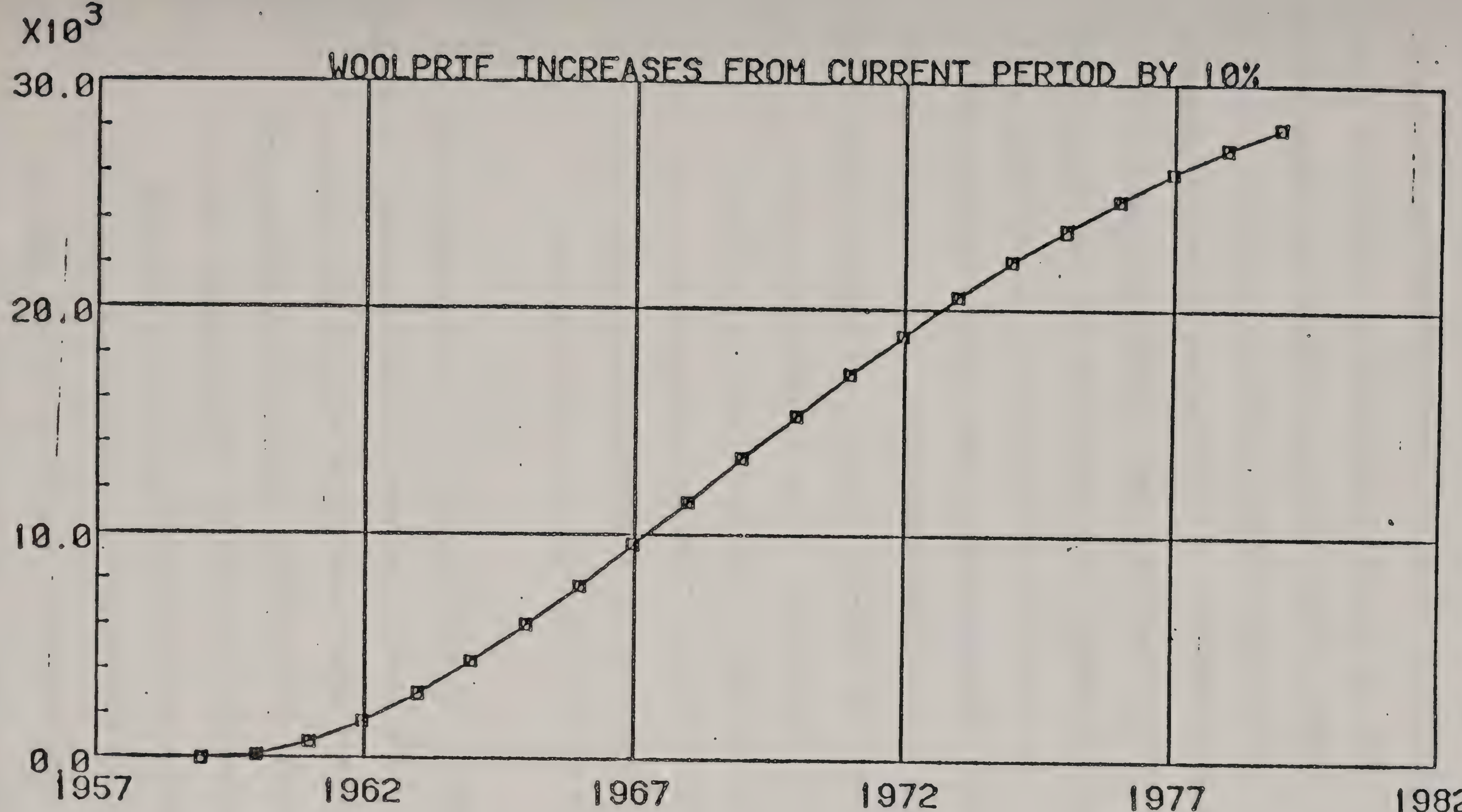
□ #1 CUM.MULT.LAMPROD



TIME BOUNDS: 1957 TO 1979

SYMBOL SCALE NAME

ם #1 IMP.MULT_WOOLPROD



TIME BOUNDS: 1957 TO 1979

SYMBOL SCALE NAME

□ #1 CUM.MULT_WOOLPROD

III.4 The Dynamic Characteristics of the Poultry Component

In this component the effects of three kinds of changes are shown: a) A simultaneous increase of 10% in the feeding cost indices for producing eggs and broilers; b) A simultaneous increase of 10% in the wholesale prices of broiler and non-broiler chicken; c) An increase of 10% in the average price of eggs received by farmers.

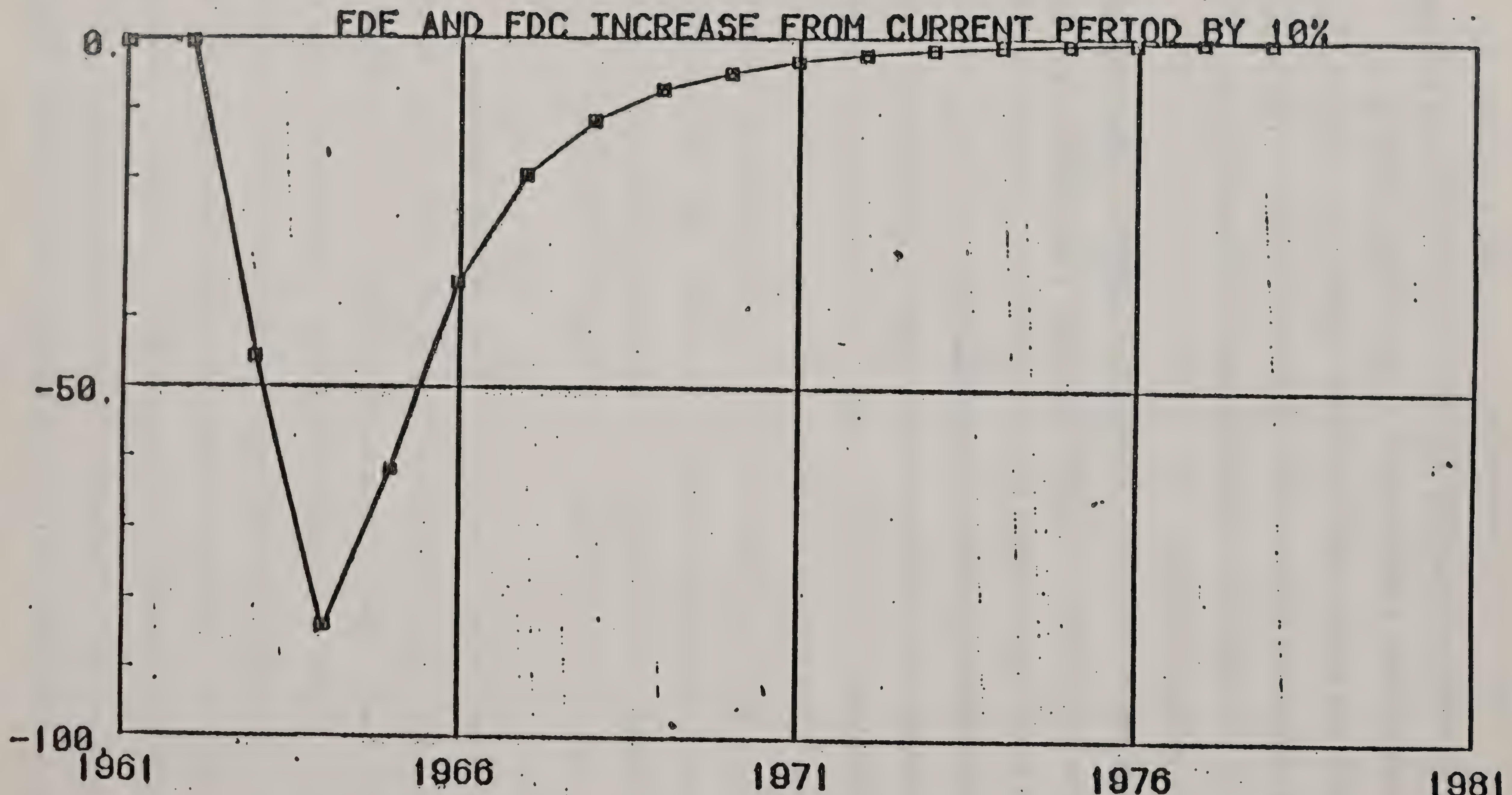
Similar to the pork component, the turnover in poultry production is fast and in the context of an annual model younger age cohorts compose no constraints on current production. The place of younger cohorts is taken by the availability of hatching eggs and of laying chickens. As a result, the adjustment patterns towards the steady state is not affected by biological constraints. Instead, these evolving patterns toward the long-run solutions are affected by how price expectations are generated and by the existence of some other short-run constraints that are not explicitly dealt with in the specification of this component. These short-run constraints are reflected by the mutual interaction of production and ending stocks and by the effects of one year lags of some of the endogenous variables.

Just as was shown in the pork component, the adjustment pattern towards equilibrium in the poultry component is also monotonous. It should be realized that it is not always possible to refer to multipliers in the poultry model because as was already explained when dealing with the dynamic characteristics of the beef and dairy component, some of the tested perturbartions imply simultaneous shocks of exogenous variables. Therefore, as the feeding cost indices in the production of eggs and broilers simultaneously increases by 10% the impact and delayed effects are mostly negative, the later diminishing in absolute

value till they vanish. It is interesting to note that the impact and delayed effect on yield of eggs are positive as the cost indices increase; the reason being that the yield of eggs is affected negatively by the number of layers and as the number of layers decrease, the yield increases. As far as egg production is concerned, the negative effect on the number of layers is stronger than the positive effects on the yield resulting in a reduction in egg production.

When the prices of broiler and non-broiler chicken are simultaneously increased and when the price of eggs is increased, the adjustment pattern of the poultry model is very similar.

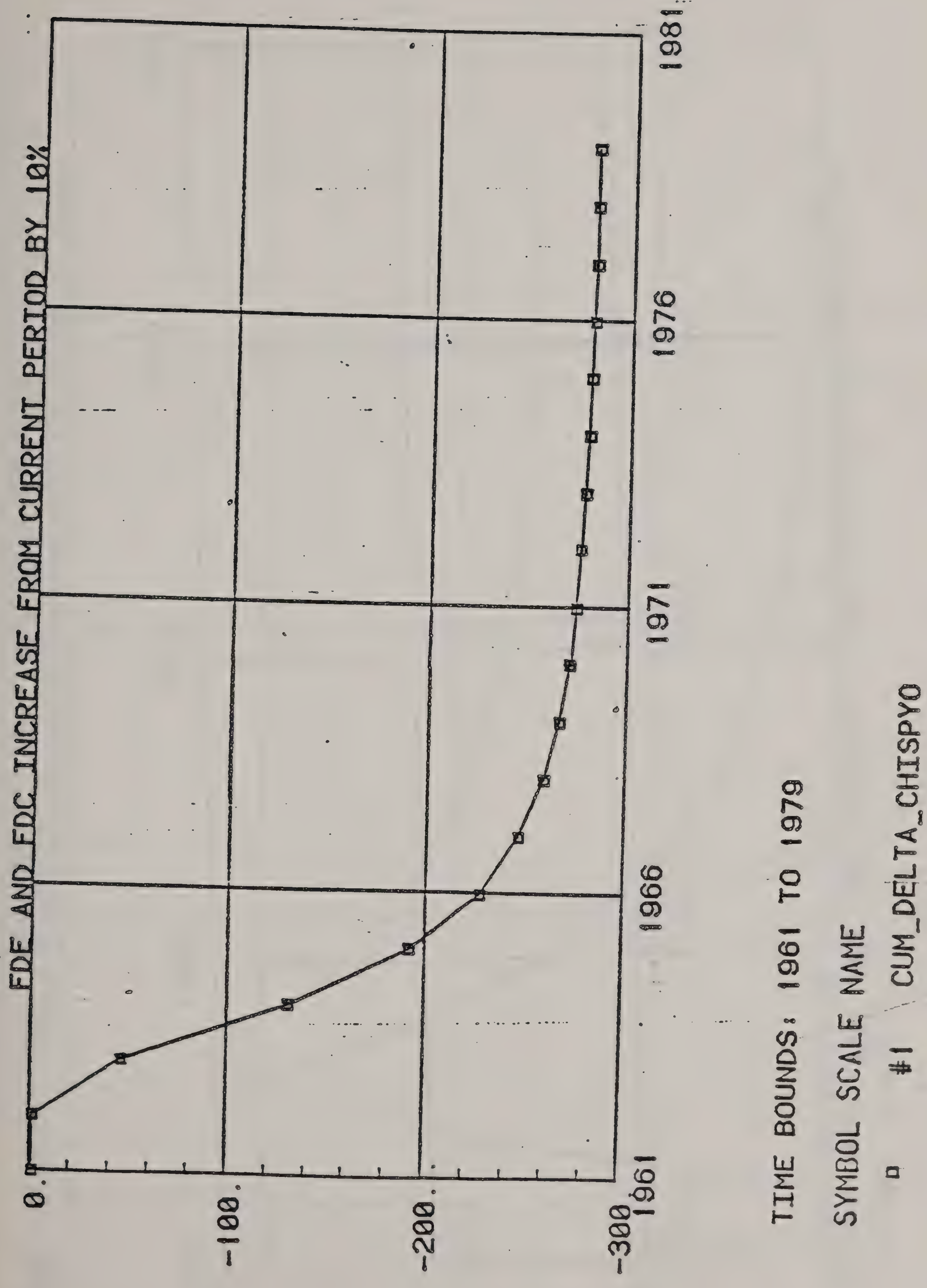
The detailed results of these perturbations are shown in the Appendix to Section III. Some characteristic results are shown in the graphs that follow.



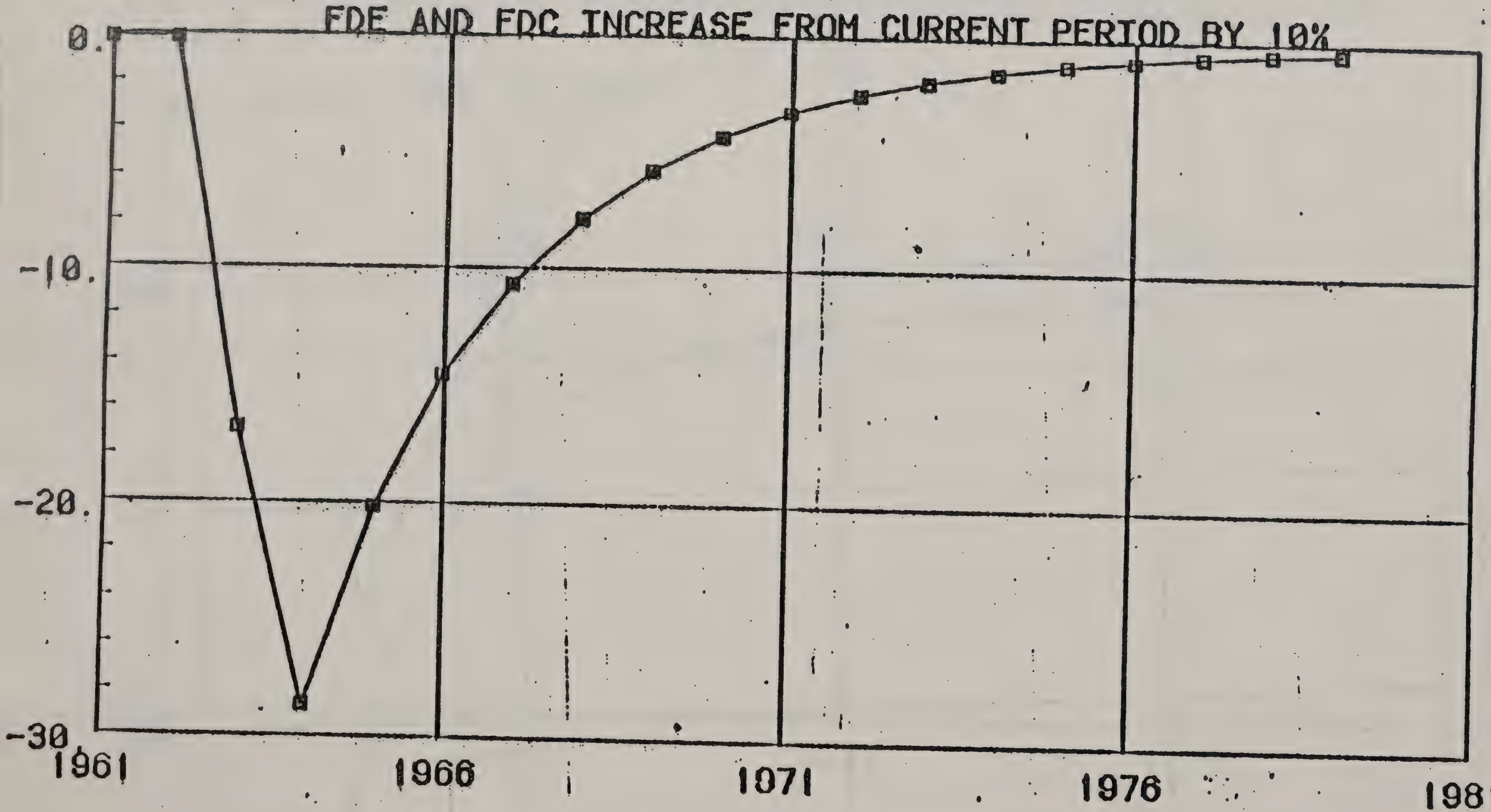
TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 DELTA_CUTSRVO

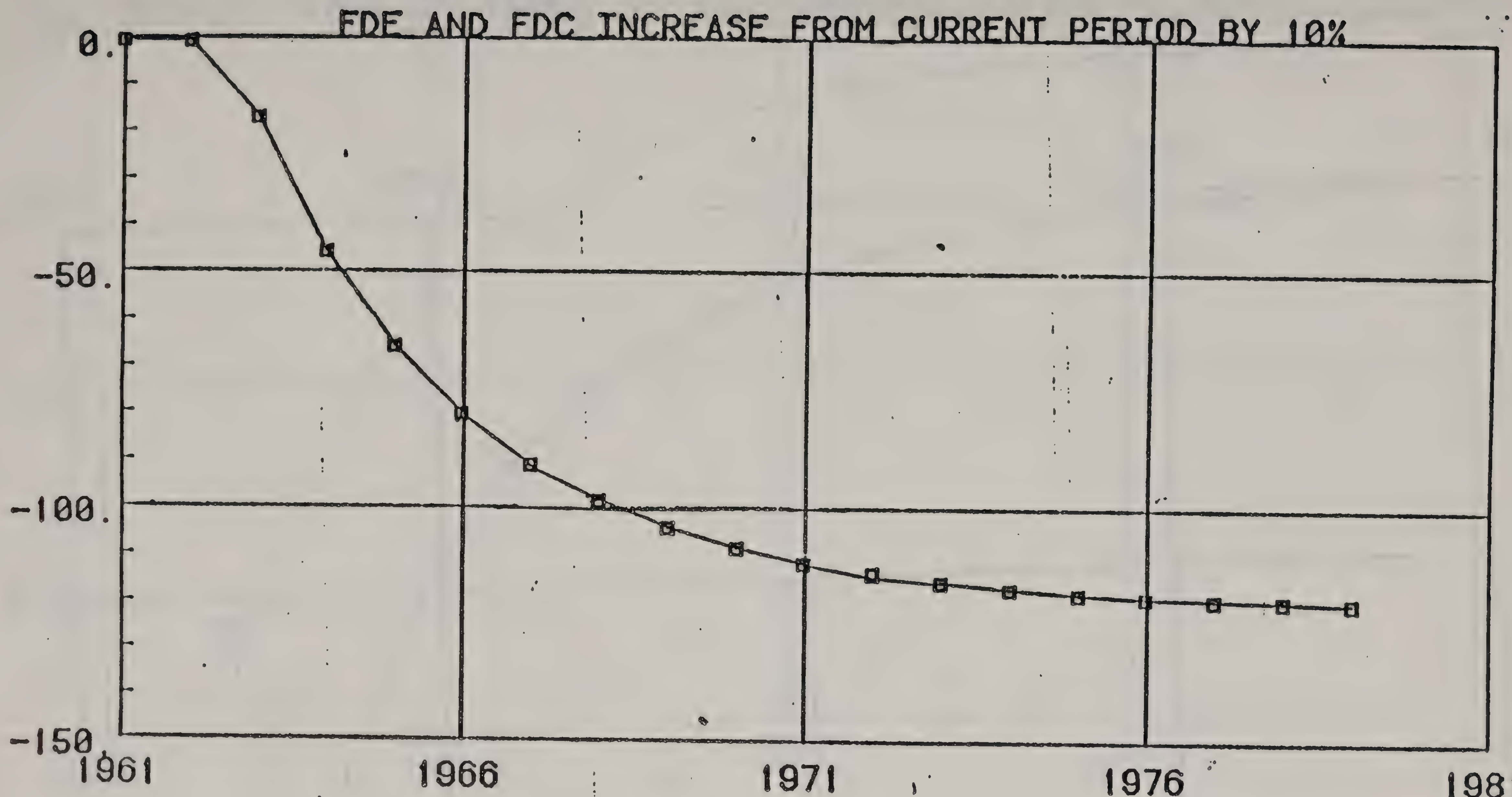


FDE AND FDC INCREASE FROM CURRENT PERIOD BY 10%
0.
-100.
-200.
-300
1961
1966
1971
1976
1981
TIME BOUNDS: 1961 TO 1979
SYMBOL SCALE NAME
□ #1 CUM_DELTA_CHISPYO



TIME BOUNDS: 1961 TO 1979

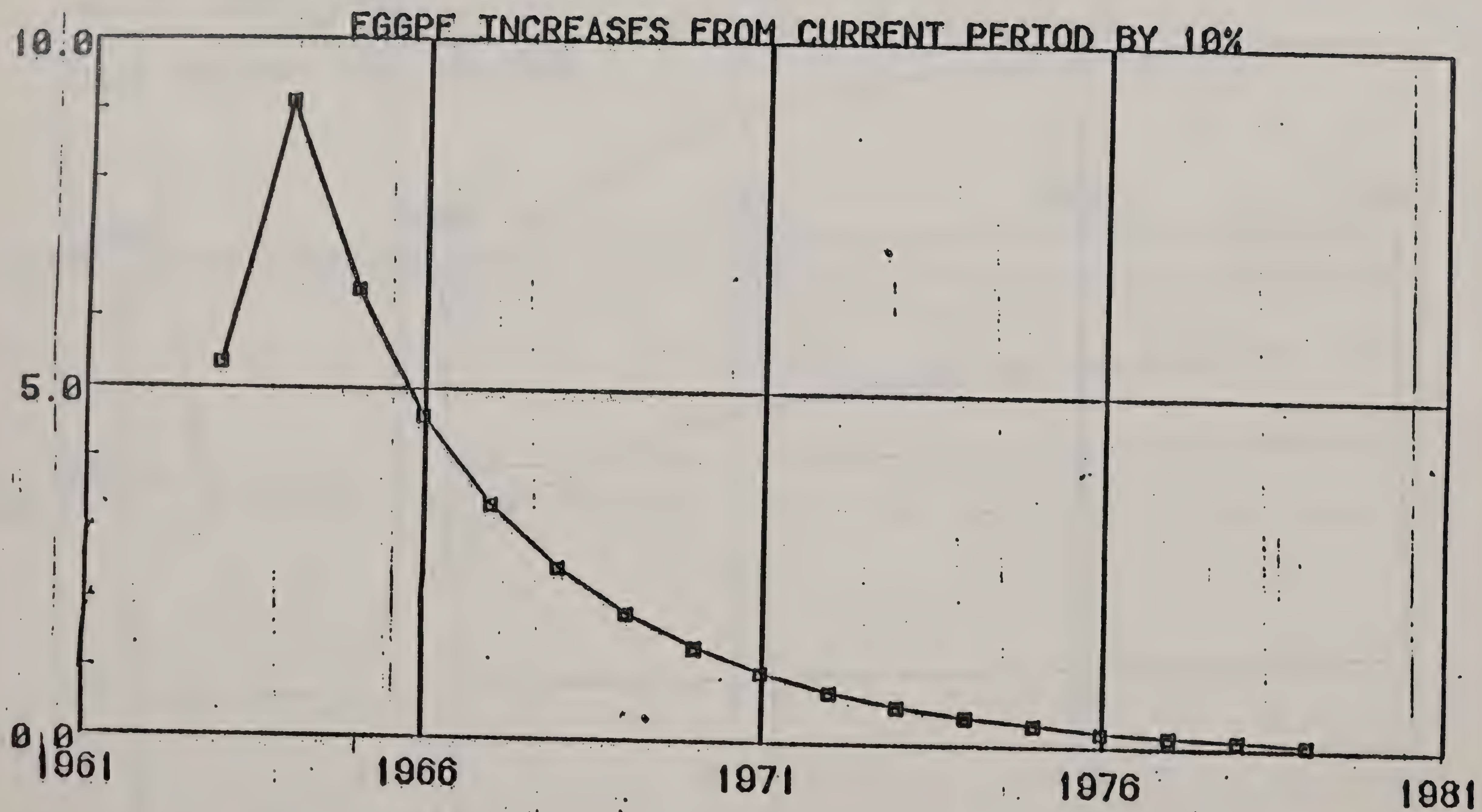
SYMBOL SCALE NAME



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

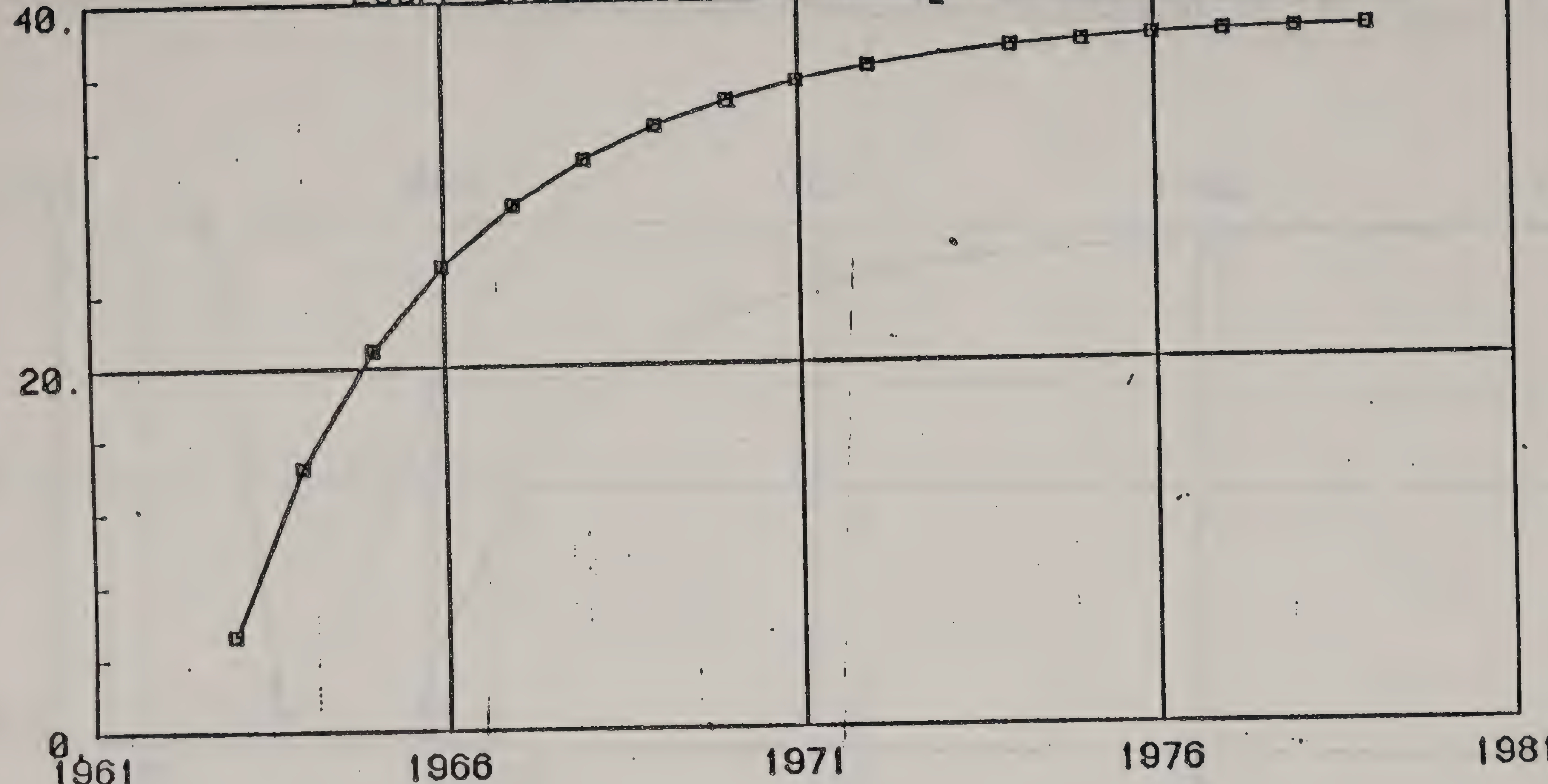
□ #1 CUM_DELTA_EGGAP



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

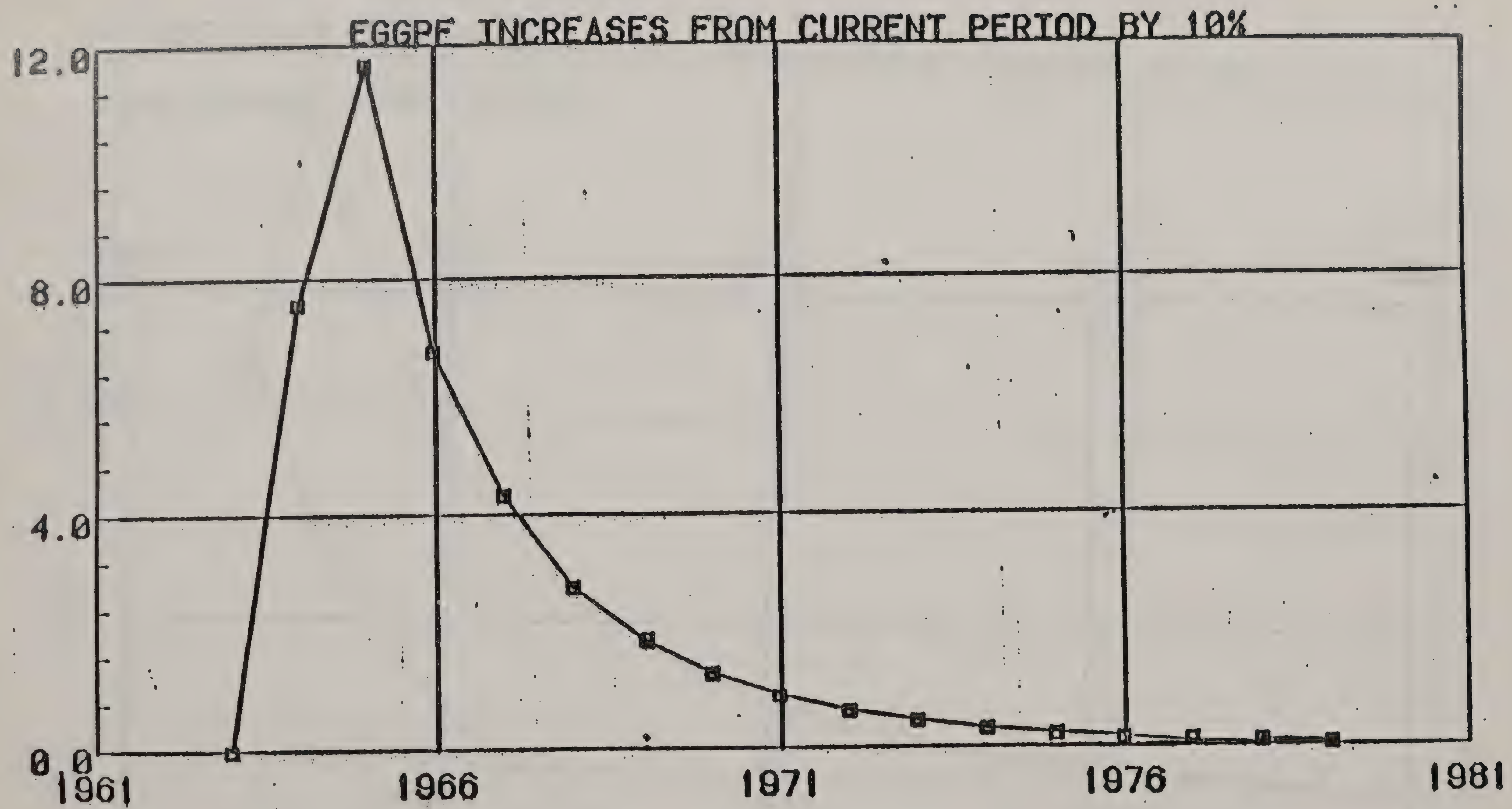
EGGPF INCREASES FROM CURRENT PERIOD BY 10%



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

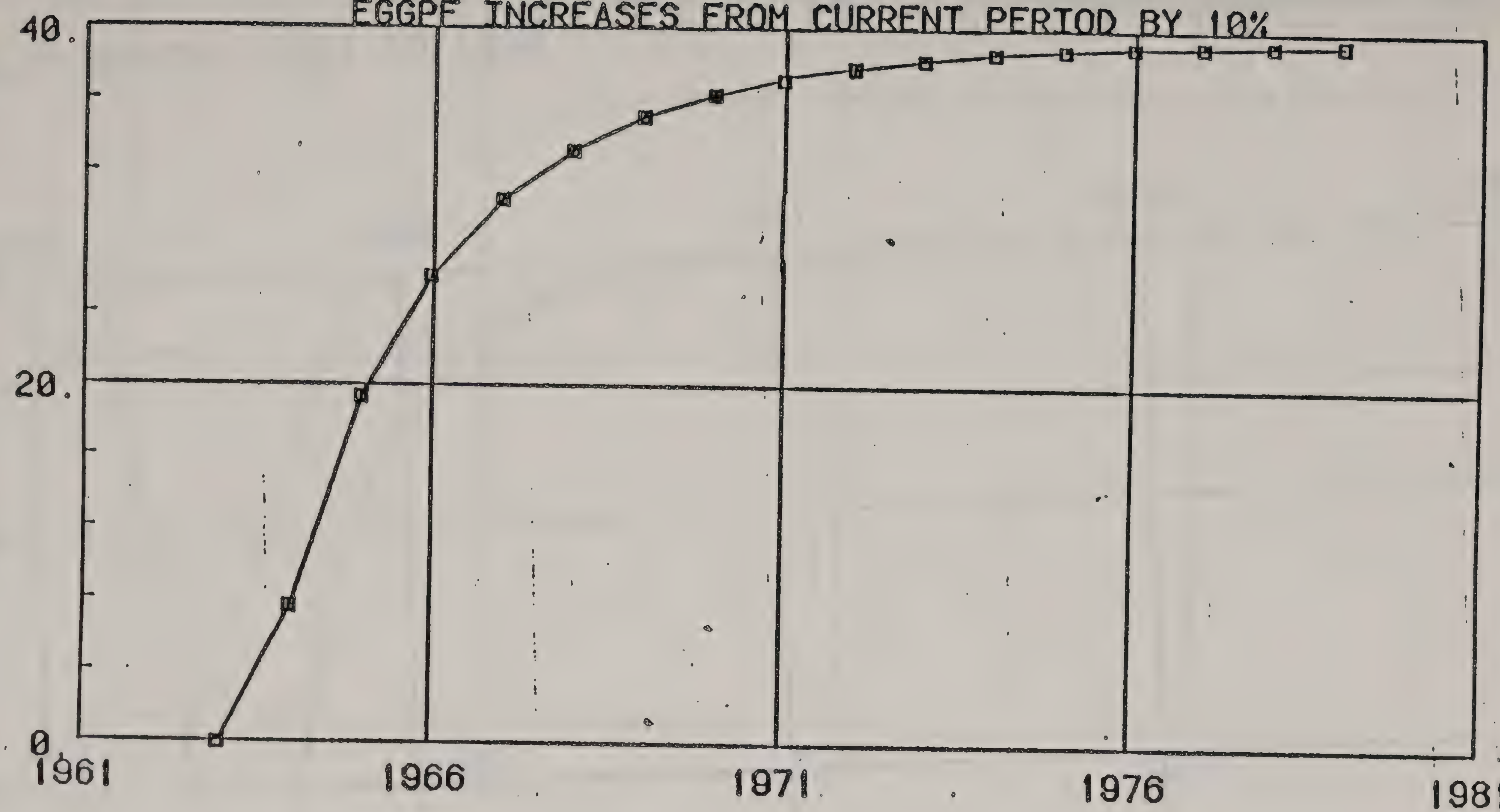
□ #1 CUM.MULT_EGGAP



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

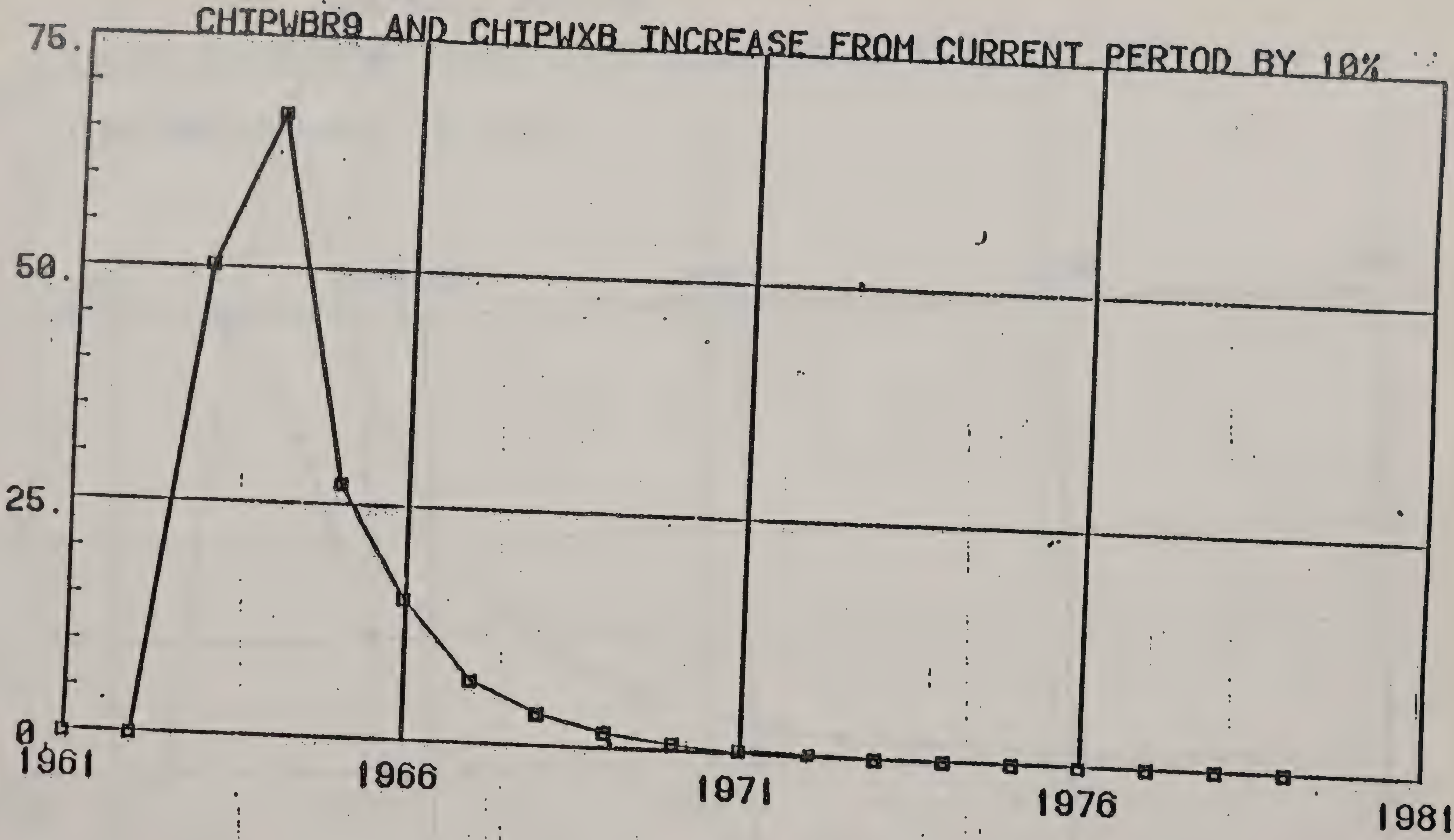
□ #1 TMP MULT CHTSPY0



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

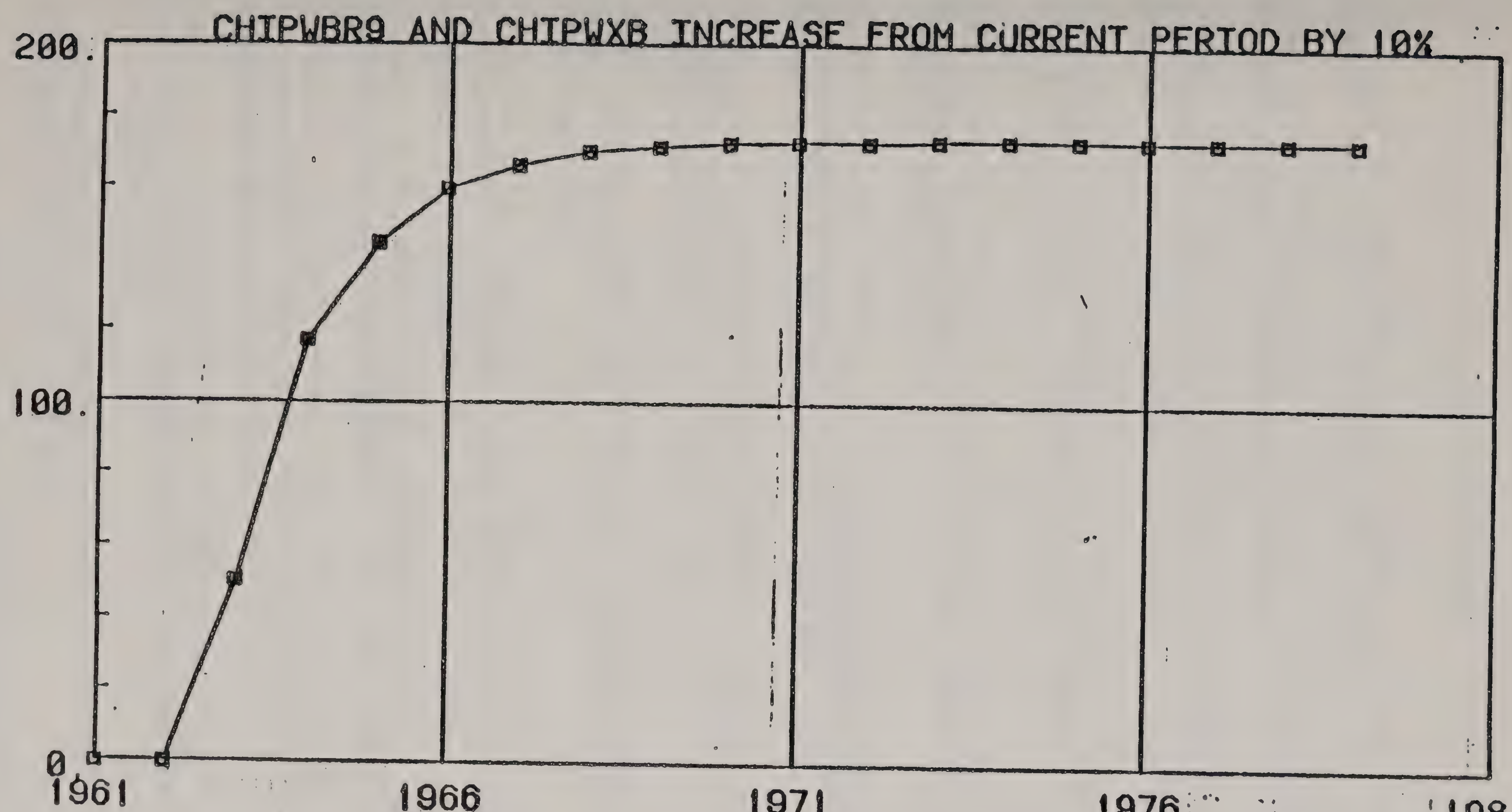
□ #1 CUM.MULT_CHISPYO



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 DELTA_CHISPYO



TIME BOUNDS: 1961 TO 1979

SYMBOL SCALE NAME

□ #1 CUM_DELTA_CHISPYO

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APPENDIX TO SECTION I

Appendix to Section I

This Appendix deals with the Jarvis (1974) model. While a simplified version of reality, this model captures the marketing and investment decisions of feedlot operators. Let A = age of steer, I = daily ration of feed, c = price of feed, P = expected price per pound of meat, W = weight of steer, r = rate of interest. Both the weight of the animal and the expected price of meat are assumed to be functions of I and A, implying that the quality of the beef is reflected in the unit price received P(A,I). Competitive conditions are assumed to prevail. In the context of this model, the competitive assumption implies that the farmer may affect the price through the quality of product but not through quantity.

The objective is to find $\hat{A},\hat{I}$ such that the expected discounted present value of profits (calf's value at birth) 4/ is maximized. This is specified as:

$$(1) \quad \text{Max } \pi(A,I) = P(A,I)W(A,I)e^{-rA} - cI\int_0^A e^{-rt}dt$$

If (1) is twice differentiable and has a maximum, then the optimal values of A and I will be obtained from the first order conditions:

$$(2) \quad W(A,I)P_A + P(A,I)W_A = cI + rPW$$

$$(3) \quad (W(A,I)P_I + P(A,I)W_I)e^{-rA} = \frac{c}{r}(1-e^{-rA})$$

where

$$P_I = \frac{\partial P}{\partial I},\ P_A = \frac{\partial P}{\partial A},\ W_I = \frac{\partial W}{\partial I} \text{ and } W_A = \frac{\partial W}{\partial A}$$

The meaning of (2) and (3) is straightforward and it related to the usual conditions effecting input demand in a profit maximizing firm. In general these conditions imply that it is necessary for every input to equally affect revenue and costs at the margin. Postponing the age of slaughter at any given feed ration will increase feeding cost by cI and capital cost by rPw. This capital cost is a result of deferring the income of PW.

The marginal revenue resulting from postponing slaughter is shown in the left hand side of (2). Similarly for any slaughter age A, the present discounted marginal revenue value resulting from an increase in the feed ration is shown in the left hand side of (3). In equilibrium this should be equal to the present value of the increase in the cost stream that results from an increase in the feeding ration. This expression is shown in the right hand side of (3).

For convenience we shall rewrite (3) as

$$(3') \quad W(A,I)P_I + P(A,I)W_I = \frac{c}{r}(e^{rA}-1)$$

The solution to (2) and (3') provided $\pi(A,I)$ is strictly concave will show the optimal value of A and I, ($\hat{A}$ and $\hat{I}$) respectively. $\hat{A}$ and $\hat{I}$ will depend on c, r and on the price structure of meat, namely $\hat{A} = \hat{A}(c,r,S)$ $\hat{I} = \hat{I}(c,r,S)$ where S is a shift parameter in the P function (initially S=0).

It should be noticed that $\hat{A}$ and $\hat{I}$ will not be affected if the meat price structure and the price of feed will increase by the same proportion. It immediately follows that the supply of meat is homogeneous of degree zero with respect to P and c.

Before deriving the properties of the partial derivatives of $\hat{A}$ and $\hat{I}$ with respect to c, r and S, the following assumptions pertaining P(A,I,S) and W(A,I) will be introduced:

$$W_A, P_A > 0; \; W_I, P_I > 0; \; W_{AI}, P_{AI} > 0; \; W_{AA}, P_{AA} < 0;$$

$$W_{II}, P_{II} < 0; \; P_S, P_{IS}, P_{AS} > 0$$

where $W_A = \frac{\partial}{\partial A}\left(\frac{\partial W}{\partial I}\right)$, $P_{AI} = \frac{\partial}{\partial A}\left(\frac{\partial P}{\partial I}\right)$, $P_S = \frac{\partial P}{\partial S}$ and so on.

Essentially we are assuming that age and feed are complementary factors in production and in pricing. We are also assuming that as S increases the price structure shifts outwards resulting in higher prices at any given quality of meat.

The comparative static analysis of changing c, r and S hinges on the properties of the Hessian matrix of (1). This matrix can be represented as:

$$(4)\begin{bmatrix} A^* & B^* \\ B^* & D^* \end{bmatrix}$$

where

$$W(P_{AA} - P_A\alpha) + P(W_{AA} - W_A\beta) = A^*$$

$$W(P_{AI} - P_I\alpha) + P(W_{AI} - W_I\beta) - c = B^*$$

$$2P_IW_I + WP_{II} + PW_{II} = D^*$$

and $\alpha = r - \frac{W_A}{W}$

$$\beta = r - \frac{P_A}{P}$$

Second order conditions for an unconstrained maximum requires

$$A^*, D^* < 0 \text{ and } A^*D^* - B^{*2} = F > 0$$

Differentiating (2) and (3) with respect to c we obtain

$$(5) \quad \frac{\partial \hat{I}}{\partial c} = \frac{1}{F}\left(D^*I - B^* \frac{e^{rA}-1}{r}\right)$$

$$(6) \quad \frac{\partial \hat{I}}{\partial c} = \frac{1}{F}\left(A^* \frac{e^{rA}-1}{r} - B^*I\right)$$

Where F is the determinant of the matrix in (4). Notice that $(e^{rA}-1)>0$. Given that A* and D* are negative numbers, the effect of an increase in the price of feed will depend on the magnitude of B*. Thus, if B* is negative and small enough, not only may the feed ration increase but also the total feed consumption may increase if $\hat{A}$ increases. According to the model this possibility may arise since the farmer could compensate for his increased cost by improving the quality and by increasing the quantity of the meat produced, thereby increasing revenue. On the other hand, if B* is large enough, an increase in the price of feed will result in a decrease in the feed ration and in slaughtering the steer at an earlier age. This will lead to a decrease in long-run production. In particular if

$$(7) \quad r < \frac{W_A}{W} \text{ or } \alpha \le 0$$

$$(8) \quad r < \frac{P_A}{P} \text{ or } \beta \leq 0$$

and $$(9) \quad WP_{AI} + PW_{AI} > c$$

B* will be positive and Jarvis postulates will hold.

Therefore, the conditions in (7), (8) and (9) are sufficient for $\frac{\partial I}{\partial c}, \frac{\partial A}{\partial c} < 0$. These sufficient conditions imply that the rates of change in weight and in price have each to be larger than the rate of interest; in addition the rate of change in marginal revenue due to an increase in the feeding ration has to be larger than the marginal cost of increasing the feeding ration (c).

Differentiating (2) and (3') with respect to r we obtain

$$(10) \quad \frac{\partial A}{\partial r} = \frac{1}{F} [D^*WP - B^* \frac{c}{r^2} (1 + e^{rA} (Ar - 1))]$$

$$(11) \quad \frac{\partial \hat{I}}{\partial r} = \frac{1}{F} [A^* \frac{c}{r^2} (1 + e^{rA} (Ar - 1)) - B^*WP]$$

Again, provided that the second order conditions hold, the affects of an increase in r may be either positive or negative. The sufficient conditions for a negative effect of r on $\hat{A}$ and $\hat{I}$ and therefore on production of meat are: $B^* > 0$ and $Ar > 1$.

Next we evaluate the effects of an outward shift in the price structure of meat. As was already mentioned, the Jarvis model implies an endogenous price of meat because price is affected by the decisions of A and I taken by the farmer. The price structure is represented by P(A,I,S) and an outward shift in the price structure will be affected by an increase in the parameter S. It should be remembered, however, that as S increases, not only does the price structure shift outward but the optimal values of A and I change as well. Therefore,

$$(13) \quad \frac{\partial P}{\partial S} = P_A \frac{\partial A}{\partial S} + P_I \frac{\partial I}{\partial S} + P_S$$

differentiating (2) and (3') with respect to S, keeping (13) in mind, we obtain

$$(14) \quad \frac{\partial \hat{A}}{\partial S} = \frac{WP_S}{F} [D^* (\alpha - P_{AS}) + B^*((W_I/W) + P_{IS})]$$

$$(15) \quad \frac{\partial \hat{I}}{\partial S} = \frac{WP_S}{F} [A^*((W_I/W) + P_{IS}) + B^*(\alpha - P_{AS})]$$

These results are not unambiguous even if the second order conditions hold. In general this model does not assure increased production as the price structure shifts outward. 5/ Nevertheless, the set of conditions specified in (7), (8) and (9) which lead to $B^* > 0$ are sufficient for an increase in the feeding ration and for keeping the animal longer on the farm as the price structure of meats shifts outwards. As a result, long-run meat production increases.

APPENDIX TO SECTION II

Data of Exogenous Variables in the Beef and Dairy Supply Model

BARPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: BARLEY, AVERAGE PRICE RECEIVED BY FARMERS, JUL-JE, US
UNITS: $/BU

1950	1.19	1.26	1.37	1.17
1954	1.09	0.92	0.99	0.887
1958	0.9	0.86	0.84	0.979
1962	0.915	0.897	0.953	1.02
1966	1.06	1.01	0.921	0.885
1970	0.973	0.993	1.21	2.14
1974	2.81	2.42	2.25	1.78
1978	1.92	2.31	NA	

BEEMI = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: BEEF, IMPORTS, US
UNITS: MIL LBS

1950	338.	472.	429.	271.
1954	231.	229.	211.	390.
1958	896.	1047.	760.	1021.
1962	1414.	1651.	1068.	923.
1966	1182.	1313.	1500.	1615.
1970	1792.	1734.	1960.	[illegible]
1974	1615.	1758.	2073.	[illegible]
1978	2297.	2406.	NA	

Data of Exogenous Variables in the Beef and Dairy Supply Model (Continued)

CALDD = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: CALVES, DEATH LOSS, US
UNITS: MIL HEAD

1950	2.297	2.326	2.431	2.487
1954	2.489	2.462	2.425	2.355
1958	2.298	2.375	2.533	2.486
1962	2.542	2.48	2.637	2.607
1966	2.424	2.512	2.485	2.591
1970	2.714	2.808	3.346	4.388
1974	4.104	4.596	3.369	4.
1978	3.88	3.7	NA	

CALPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: CALVES, VEAL, AVERAGE PRICE RECEIVED BY FARMERS, US
UNITS: $/CWT

1950	26.3	31.9	25.8	16.7
1954	16.5	16.8	16.1	18.7
1958	25.3	26.7	22.9	23.7
1962	25.1	24.	20.4	22.1
1966	26.	26.3	27.6	31.5
1970	34.5	36.4	44.7	56.6
1974	35.2	27.2	34.2	36.9
1978	59.1	88.6	NA	

Data of Exogenous Variables in the Beef and Dairy Supply Model (Continued)

CATPFFD = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: CATTLE, PRICE, SLAUGHTER STEERS, OMAHA, ALL WTS. AND GRADES
UNITS: $/CWT

1950	27.88	34.18	31.04	21.91
1954	22.67	21.39	20.15	22.07
1958	25.59	26.11	24.27	23.17
1962	25.45	22.7	21.51	24.33
1966	25.27	24.88	26.42	29.24
1970	29.02	32.03	35.49	44.54
1974	41.89	44.61	39.11	40.38
1978	52.34	67.67	NA	

CATPFFE = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: CHOICE FEEDER CATTLE, KANS., CITY, ALL WTS. AND GRADES
UNITS: $/CWT

1950	26.67	32.63	25.55	17.35
1954	18.97	18.6	17.37	20.33
1958	25.56	25.61	22.93	23.3
1962	24.53	22.95	19.79	22.5
1966	25.41	24.67	25.89	29.3
1970	30.15	32.09	38.89	49.13
1974	36.49	33.42	37.65	38.74
1978	56.36	77.02	NA	

Data of Exogenous Variables in the Beef and Dairy Supply Model (Continued)

CATPFNF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: CATTLE, UTILITY COW PRICE, OMAHA
UNITS: $/CWT

1950	19.26	24.03	18.54	12.04
1954	11.11	10.99	10.91	13.4
1958	17.87	17.47	15.31	15.65
1962	15.37	14.73	13.24	14.44
1966	17.83	17.22	17.94	20.29
1970	21.32	21.62	25.21	32.82
1974	25.56	21.09	25.31	25.32
1978	36.79	50.1	NA	

CORPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: CORN, AVERAGE PRICE RECEIVED BY FARMERS, OCT-SEP, US
UNITS: $/BU

1950	1.52	1.66	1.52	1.48
1954	1.43	1.35	1.29	1.11
1958	1.12	1.05	1.	1.1
1962	1.12	1.11	1.17	1.16
1966	1.24	1.03	1.08	1.16
1970	1.33	1.08	1.57	2.55
1974	3.02	2.54	2.15	2.02
1978	2.25	2.36	NA	

Data of Exogenous Variables in the Beef and Dairy Supply Model (Continued)

DUM73 = DATE REVISED: 2/10/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: DUMMY VARIABLE, 1973=1, OTHERS=0

1950	0.	0.	0.	0.
1954	0.	0.	0.	0.
1958	0.	0.	0.	0.
1962	0.	0.	0.	0.
1966	0.	0.	0.	0.
1970	0.	0.	0.	1.
1974	0.	0.	0.	0.
1978	0.	0.	0.	

DUM74 = DATE REVISED: 2/10/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: DUMMY VARIABLE, 1974=1, OTHERS=0

1950	0.	0.	0.	0.
1954	0.	0.	0.	0.
1958	0.	0.	0.	0.
1962	0.	0.	0.	0.
1966	0.	0.	0.	0.
1970	0.	0.	0.	0.
1974	1.	0.	0.	0.
1978	0.	0.	0.	

Data of Exogenous Variables in the Beef and Dairy Supply Model (Continued)

MILPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: MILK,ALL SOLD TO PLANTS, AV.WHOLESALE PRICE RECEIVED BY FARMERS,US
UNITS: $/CWT

1950	3.89	4.58	4.85	4.32
1954	3.97	4.01	4.14	4.21
1958	4.13	4.16	4.21	4.22
1962	4.09	4.1	4.15	4.23
1966	4.81	5.02	5.24	5.49
1970	5.71	5.87	6.07	7.14
1974	8.33	8.75	9.66	9.72
1978	10.6	12.	NA	

OATPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: OATS, AVERAGE PRICE RECEIVED BY FARMERS, JUL-JE, US
UNITS: $/BU

1950	0.788	0.82	0.789	0.742
1954	0.714	0.6	0.686	0.605
1958	0.578	0.646	0.599	0.642
1962	0.624	0.622	0.631	0.622
1966	0.666	0.659	0.598	0.584
1970	0.623	0.604	0.724	1.18
1974	1.53	1.46	1.56	1.1
1978	1.2	1.36	NA	

Data of Exogenous Variables in the Beef and Dairy Supply Model (Continued)

PCOWIMP = DATE REVISED: 2/10/81
ANNUAL DATA FROM 1950 TO 1979

DESCRIPTION: PERCENTAGE COWS ON THE SUPERVISED BY DAIRY HERD
IMPROVEMENT ASSOCIATION
UNITS: PERCENTAGE
SOURCE: COMPUTED FROM: COWIMP/COWSNMC

1950	0.049494	0.054258	0.054885	0.056945
1954	0.06028	0.062564	0.067741	0.073185
1958	0.08042	0.088229	0.098966	0.107387
1962	0.114591	0.121094	0.125949	0.135733
1966	0.14207	0.152927	0.162556	0.170434
1970	0.175503	0.186279	0.190615	0.20303
1974	0.213921	0.216841	0.21993	0.233907
1978	0.247195	0.257778		

PTDUM590 = DATE REVISED: 1/21/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: DUMMY VARIABLE TO SPLICE DATA
UNITS: NONE

1950	3.	3.	3.	3.
1954	3.	3.	3.	2.
1958	1.	0.	0.	0.
1962	0.	0.	0.	0.
1966	0.	0.	0.	0.
1970	0.	0.	0.	0.
1974	0.	0.	0.	0.
1978	0.	0.	0.	

Data of Exogenous Variables in the Beef and Dairy Supply Model (Continued)

PTFRMCP4 = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: INTEREST RATE, PRIME COMMERCIAL PAPER, 4-6 MO.
UNITS: PERCENT

1950	1.45	2.16	2.33	2.52
1954	1.58	2.18	3.31	3.81
1958	2.46	3.97	3.85	2.97
1962	3.26	3.55	3.97	4.38
1966	5.55	5.1	5.9	7.83
1970	7.72	5.11	4.69	8.15
1974	9.87	6.33	5.35	5.6
1978	7.99	10.91	NA	

PTPCSOT = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: TRANSPORTATION, CONSUMER PRICE INDEX
UNITS: INDEX(1967=1.0)

1950	0.682	0.725	0.773	0.795
1954	0.783	0.774	0.788	0.833
1958	0.86	0.896	0.896	0.906
1962	0.925	0.93	0.943	0.959
1966	0.972	1.	1.032	1.072
1970	1.127	1.186	1.199	1.238
1974	1.377	1.506	1.655	1.772
1978	1.855	2.12	NA	

Data of Exogenous Variables in the Beef and Dairy Supply Model (Continued)

PTPW05: - DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: FUEL AND UTILITIES, CONSUMER PRICE INDEX
UNITS: 1967=1.0

1950	0.76	0.787	0.8	0.83
1954	0.835	0.851	0.873	0.899
1958	0.917	0.938	0.959	0.971
1962	0.973	0.982	0.984	0.983
1966	0.988	1.	1.013	1.036
1970	1.076	1.15	1.201	1.269
1974	1.502	1.678	1.827	2.022
1978	2.16	2.393	NA	

PTHRHMP - DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: WAGE RATE IN MEAT PACKING INDUSTRY
UNITS: $/HR

1950	1.4	1.56	1.68	1.79
1954	1.84	1.96	2.08	2.23
1958	2.38	2.5	2.6	2.69
1962	2.77	2.82	2.91	2.99
1966	3.09	3.24	3.45	3.67
1970	3.98	4.2	4.46	4.77
1974	5.2	5.67	6.06	6.57
1978	7.09	7.73	NA	

Data of Exogenous Variables in the Beef and Dairy Supply Model (Continued)

SOMPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: SOYBEAN MEAL PRICE, US (C.Y.)
UNITS: CENTS/LB

1950	3.222	4.168	3.378	3.952
1954	3.035	2.627	2.373	2.67
1958	2.79	2.778	3.03	3.18
1962	3.565	3.55	3.51	4.075
1966	3.94	3.845	3.705	3.92
1970	3.925	4.51	11.45	7.318
1974	6.542	7.388	9.99	8.21
1978	9.5	9.	NA	

SORPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: SORGHUM, FARM PRICE, OCT YR
UNITS: $/BU

1950	1.053	1.322	1.579	1.322
1954	1.26	0.977	1.148	0.973
1958	0.999	0.858	0.836	1.008
1962	1.019	0.977	1.053	0.984
1966	1.019	0.992	0.949	1.07
1970	1.142	1.042	1.372	2.139
1974	2.772	2.369	2.027	1.82
1978	2.02	2.33	NA	

Data of Exogenous Variables in the Beef and Dairy Supply Model (Continued)

WHEPF - DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: WHEAT, AVERAGE PRICE RECEIVED BY FARMERS, JUL-JE, US
UNITS: $/BU

1950	2.	2.11	2.09	2.04
1954	2.12	1.98	1.97	1.93
1958	1.75	1.76	1.74	1.83
1962	2.04	1.85	1.37	1.35
1966	1.63	1.39	1.24	1.25
1970	1.33	1.34	1.76	3.95
1974	4.09	3.56	2.73	2.33
1978	2.98	3.82	NA	

COWIMP - DATE REVISED: 1/26/81
ANNUAL DATA FROM 1950 TO 1979

DESCRIPTION: NUMBERS OF COWS ON TEST BY DAIRY HERD ASSOCIATION
UNITS: MIL HEAD
SOURCE: AGRI. STATISTICS 1966, PAGE 381, TABLE 555 AND AGRI. STATISTICS
1969, PAGE 361, TABLE 531

1950	1.08887	1.18661	1.1663	1.22659
1954	1.3117	1.33387	1.40631	1.4798
1958	1.54888	1.60754	1.74675	1.86747
1962	1.95835	2.00653	2.01014	2.08758
1966	2.05859	2.09892	2.13193	2.13895
1970	2.12201	2.2184	2.24468	2.35961
1974	2.41667	2.43296	2.43836	2.58116
1978	2.70406	2.79406		

Statistical Estimates of the Equations in the Beef and Dairy Model

```
88  WEISBBE = C1+C2*COWSNBE+C3*CATPFFD/CORPF+C4*CATPFFD(-1)/CORPF(-1)
              +C5*CATPFFD(-2)/CORPF(-2)+C6*PTDUMS90

NOB = 27        NOVAR = 6
RANGE =  1953 TO 1979
RSQ =    0.84136       CRSQ =    0.80359      F(5/21) =     22.275
SER =    0.5756        SSR =       6.956      DW(0) =   1.70      COND(X) =     38.30
LHS MEAN =      5.51915       SR =        0.00003

COEF              VALUE             ST ER            T-STAT            MEAN

C1               -0.58308           1.66552          -0.35009           1.00000
C2                0.18254           0.02302           7.92963          32.79130
C3               -0.10750           0.03941          -2.72785          20.92180
C4                0.01934           0.04700           0.41152          20.61610
C5                0.07985           0.03917           2.03887          20.51720
C6                0.59107           0.18730           3.15578           0.55556


91  COWSEMC = C1+C2*COWSNMC(-3)+C3*MILPF/CATPFNF

NOB = 27        NOVAR = 3
RANGE =  1953 TO 1979
RSQ =    0.93074       CRSQ =    0.92497      F(2/24) =    161.260
SER =    0.1858        SSR =       0.829      DW(0) =   0.39      COND(X) =     14.98
LHS MEAN =      2.95900       SR =        0.00005

COEF              VALUE             ST ER            T-STAT            MEAN

C1               -0.34989           0.24891          -1.40568           1.00000
C2                0.15929           0.00915          17.41290          16.41190
C3                2.31701           0.68018           3.40649           0.29981
```

Statistical Estimates of the Equations in the Beef and Dairy Model (Continued)

10) COWKSNF = C1+C2*COWSNBE+C3*CATPFFD(-1)/CORPF(-1)+C4*CATPFFD(-2)/CORPF(-2)+C5*PTDUMS90

NOB = 27 NOVAR = 5
RANGE = 1953 TO 1979
RSQ = 0.87087 CRSQ = 0.85448 F(4/22) = 39.167
SER = 0.7181 SSR = 11.345 DW(0) = 1.54 COND(X) = 30.28
LHS MEAN = 4.32207 SR = 0.00003

COEF	VALUE	ST ER	T-STAT	MEAN
C1	1.46304	1.74770	0.83712	1.00000
C2	0.24441	0.02757	8.86384	32.79130
C3	-0.11995	0.05436	-2.20675	20.61610
C4	-0.14927	0.04761	-3.13533	20.51720
C5	0.68377	0.20793	3.28842	0.55556

11) COWKSMC = C1+C2*COWSEMC+C3*COWSEMC(-1)+C4*MILPF/CORPF

NOB = 27 NOVAR = 4
RANGE = 1953 TO 1979
RSQ = 0.93428 CRSQ = 0.92571 F(3/23) = 108.997
SER = 0.2105 SSR = 1.019 DW(0) = 1.84 COND(X) = 120.46
LHS MEAN = 3.05248 SR = 0.00001

COEF	VALUE	ST ER	T-STAT	MEAN
C1	0.45654	0.45202	1.01000	1.00000
C2	-1.78209	0.58563	-3.04301	2.95900
C3	2.72397	0.55218	4.93310	3.02074
C4	-0.09157	0.07110	-1.28791	3.92365

Statistical Estimates of the Equations in the Beef and Dairy Model (Continued)

12: SAHKSFD = C1+C2*CATPFFD/CORPF+C3*CATPFFD(-1)/CORPF(-1)+C4*(CALSC(-2)-CALDD(-2)-CALKS(-2))+C5*SAHKSFD(-1)

NOB = 27 NOVAR = 5
RANGE = 1953 TO 1979
RSQ = 0.97461 CRSQ = 0.96999 F(4/22) = 211.096
SER = 1.1669 SSR = 29.958 DW(0) = 1.40 COND(X) = 64.67
LHS MEAN = 19.36330 SR = 0.00019

COEF	VALUE	ST ER	T-STAT	MEAN
C1	-11.85090	3.98290	-2.97543	1.00000
C2	0.11555	0.07968	1.45017	20.92180
C3	0.23420	0.08401	2.78783	20.61610
C4	0.40386	0.13602	2.92619	32.99340
C5	0.56909	0.12663	4.49396	18.70240

13: SAHKS = C1+C2*PTDUM590+C3*CATPFFD/CORPF+C4*(CALSC(-2)-CALDD(-2)-CALKS(-2))+C5*DUM73+C6*SAHKS(-1)

NOB = 27 NOVAR = 6
RANGE = 1953 TO 1979
RSQ = 0.97176 CRSQ = 0.96504 F(5/21) = 144.544
SER = 0.9974 SSR = 20.892 DW(0) = 1.17 COND(X) = 69.65
LHS MEAN = 24.86610 SR = 0.00027

COEF	VALUE	ST ER	T-STAT	MEAN
C1	3.96644	3.01434	1.31586	1.00000
C2	-0.69279	0.27899	-2.48322	0.55556
C3	-0.10003	0.08548	-1.17024	20.92180
C4	0.31445	0.13964	2.25181	32.99340
C5	-3.26567	1.08129	-3.02017	0.03704
C6	0.53928	0.15333	3.51712	24.33540

Statistical Estimates of the Equations in the Beef and Dairy Model (Continued)

```
14:  BEEAPFD = C1+C2*SAHKSFD+C3*CATPFFE/CV1+C4*CATPFFE(-1)/CV1(-1)+C5*CATPFFE(-2)/CV1(-2)
               +C6*BEEAPFD(-1)

NOB = 27       NOVAR = 6
RANGE =   1953 TO 1979
RSQ =    0.99869       CRSQ =    0.99837      F(5/21) =   3190.840
SER = 179.4120         SSR = 6.760E+05        DW(0) =   2.10       COND(X) =     96.76
LHS MEAN =  12289.20000      SR =        0.30859

COEF              VALUE            ST ER          T-STAT         MEAN

C1          -2958.00000        992.59200       -2.98007       1.00000
C2            583.75400         24.72820       23.60680      19.36330
C3            231.50200        184.49700        1.25478       4.50434
C4            639.93700        229.57600        2.78748       4.49279
C5           -288.62000        202.26200       -1.42696       4.49888
C6              0.11196          0.03619        3.09406   11828.80000


15:  BEEAPNF = C1+C2*CATKSNF+C3*PTDUM590+C4*CATPFFD/CORPF

NOB = 27       NOVAR = 4
RANGE =   1953 TO 1979
RSQ =    0.97482       CRSQ =    0.97154      F(3/23) =    296.813
SER = 267.1200         SSR = 1.641E+06        DW(0) =   1.19       COND(X) =     24.04
LHS MEAN =    6483.85000      SR =        0.21655

COEF              VALUE            ST ER          T-STAT         MEAN

C1            458.90800        558.96900        0.82099       1.00000
C2            536.10200         22.16080       24.19150      12.94170
C3           -440.16500         59.22870       -7.43161       0.55556
C4            -31.95600         17.32930       -1.84408      20.92180
```

Statistical Estimates of the Equations in the Beef and Dairy Model (Continued)

```
16:  CALKS = C1+C2*(CALSC(-1)-CALDD(-1)-CALKS(-1))+C3*CURPF/CATPFFD+C4*DUM73+C5*DUM74

NOB = 27      NOVAR = 5
RANGE =  1953 TO 1979
RSQ =    0.9437        CRSQ =    0.93347      F(4/22) =     92.193
SER =    0.8526        SSR =     15.994       DW(0) =  2.10        COND(X) =     22.68
LHS MEAN =      7.14570      SR =        -0.00012
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	12.46670	1.70141	7.32731	1.00000
C2	-0.40575	0.03390	-11.96730	33.40310
C3	171.63200	20.12160	8.52976	0.04962
C4	-3.19870	0.94918	-3.36995	0.03704
C5	-4.46092	1.09067	-4.09006	0.03704

```
17:  CALSC = C1+C2*(COWSNBE+COWSNMC-COWSNBE(-1)-COWSNMC(-1))+C3*CALSC(-1)

NOB = 27      NOVAR = 3
RANGE =  1953 TO 1979
RSQ =    0.96711       CRSQ =    0.96437      F(2/24) =     352.815
SER =    0.6301        SSR =      9.530       DW(0) =  1.64        COND(X) =     25.88
LHS MEAN =      43.83630     SR =         0.00034
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	3.80891	1.55395	2.45111	1.00000
C2	0.71810	0.08220	8.73600	0.24507
C3	0.91255	0.03543	25.75520	43.67040

Statistical Estimates of the Equations in the Beef and Dairy Model (Continued)

18: VEAAT = C1+C2*CALKS+C3*VEAAT(-1)+C4*CATPFFD(-1)/CALPF(-1)

```
NOB = 27        NOVAR = 4
RANGE =  1953 TO 1979
RSQ =    0.99274      CRSQ =    0.99179       F(3/23) =   1048.550
SER =  32.2597        SSR = 23935.800         DW(0) =  1.81      COND(X) =     19.71
LHS MEAN =    878.85200      SR =        0.01025
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	-40.33540	36.90820	-1.09286	1.00000
C2	119.66500	5.19817	23.02070	7.14570
C3	-0.23108	0.05070	-4.55772	903.66700
C4	255.89800	42.58040	6.00976	1.06648

19: BEEHT = C1+C2*BEEAP+C3*BEEAP(-1)

```
NOB = 27        NOVAR = 3
RANGE =  1953 TO 1979
RSQ =    0.78553      CRSQ =    0.76765       F(2/24) =     43.951
SER =  42.8515        SSR = 44070.100         DW(0) =  1.97      COND(X) =     49.54
LHS MEAN =    290.03700      SR =        0.01031
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	-65.45290	39.04930	-1.67616	1.00000
C2	0.03088	0.00908	3.39975	18826.00000
C3	-0.01232	0.00855	-1.43991	18336.10000

Statistical Estimates of the Equations in the Beef and Dairy Model (Continued)

208 COWYILD = C1+C2*PCOWIMP+C3*COWYILD(-1)+C4*MILPF/CORPF+C5*(2*COWSNMC+COWSEMC-COWKSMC)/2

NOB = 27 NOVAR = 5
RANGE = 1953 TO 1979
RSQ = 0.99729 CRSQ = 0.9968 F(4/22) = 2025.970
SER = 0.1053 SSR = 0.244 DW(0) = 2.43 COND(X) = 229.44
LHS MEAN = 8.43532 SR = 0.00004

COEF	VALUE	ST ER	T-STAT	MEAN
C1	2.99768	1.39274	2.15237	1.00000
C2	6.35387	4.05667	1.56628	0.14689
C3	0.63117	0.17808	3.54439	8.21377
C4	0.08893	0.03287	2.70515	3.92365
C5	-0.06783	0.03245	-2.09011	15.16860

221 MILAP2 = C1+C2*PCOWIMP+C3*MILAP(-1)+C4*MILPF/CORPF+C5*(2*COWSNMC+COWSEMC-COWKSMC)/2

NOB = 27 NOVAR = 5
RANGE = 1953 TO 1979
RSQ = 0.79402 CRSQ = 0.75657 F(4/22) = 21.201
SER = 1.7461 SSR = 67.073 DW(0) = 1.72 COND(X) = 121.19
LHS MEAN = 121.26500 SR = 0.00055

COEF	VALUE	ST ER	T-STAT	MEAN
C1	11.52940	14.93320	0.77207	1.00000
C2	57.32200	20.60760	2.78160	0.14689
C3	0.64049	0.10299	6.21896	120.94800
C4	1.08354	0.54624	1.98364	3.92365
C5	1.29201	0.34949	3.69682	15.16860

Data of Exogenous Variables in the Pork Supply Model

BAGPM7C = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: BARROWS AND GILTS, PRICE, SEVEN MARKETS
UNITS: $/CWT

1950	18.52	20.56	18.13	21.99
1954	22.25	15.19	14.82	18.29
1958	20.25	14.64	15.96	17.16
1962	16.82	15.38	15.31	21.3
1966	23.49	19.37	19.19	23.71
1970	21.95	18.45	26.67	40.27
1974	35.12	48.32	43.11	41.07
1978	48.49	42.06	NA	

CORPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: CORN, AVERAGE PRICE RECEIVED BY FARMERS, OCT-SEP, US
UNITS: $/BU

1950	1.52	1.66	1.52	1.48
1954	1.43	1.35	1.29	1.11
1958	1.12	1.05	1.	1.1
1962	1.12	1.11	1.17	1.16
1966	1.24	1.03	1.08	1.16
1970	1.33	1.08	1.57	2.55
1974	3.02	2.54	2.15	2.02
1978	2.25	2.36	NA	

Data of Exogenous Variables in the Pork Supply Model (Continued)

DUM73 - DATE REVISED: 2/10/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: DUMMY VARIABLE, 1973=1, OTHERS=0

1950	0.	0.	0.	0.
1954	0.	0.	0.	0.
1958	0.	0.	0.	0.
1962	0.	0.	0.	0.
1966	0.	0.	0.	0.
1970	0.	0.	0.	1.
1974	0.	0.	0.	0.
1978	0.	0.	0.	

DUM74 - DATE REVISED: 2/10/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: DUMMY VARIABLE, 1974=1, OTHERS=0

1950	0.	0.	0.	0.
1954	0.	0.	0.	0.
1958	0.	0.	0.	0.
1962	0.	0.	0.	0.
1966	0.	0.	0.	0.
1970	0.	0.	0.	0.
1974	1.	0.	0.	0.
1978	0.	0.	0.	

Data of Exogenous Variables in the Pork Supply Model (Continued)

PIGDD = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: PIGS:DEATH LOSS PERCENT=HOGSM+BAGKS+PIGSEBR/HOGSM! PIGSC
UNITS: PERCENT

1950	0.10194	0.10041	0.08974	0.08416
1954	0.08136	0.07192	0.05774	0.06877
1958	0.0748	0.07316	0.05409	0.06574
1962	0.05932	0.0244	0.05089	0.06357
1966	0.04317	0.0464	0.03952	0.05317
1970	0.02984	0.04641	0.05646	0.06268
1974	0.04847	0.05972	0.03022	0.04595
1978	0.05694	0.03609	NA	

PORMI77 = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: PORK, IMPORTS, CARCASS WT., US
UNITS: MIL.LB.

1950	NA	NA	NA	NA
1954	NA	214.	186.	178.
1958	234.	226.	222.	224.
1962	256.	262.	313.	382.
1966	430.	440.	462.	450.
1970	491.	496.	538.	533.
1974	488.	439.	469.	439.
1978	495.	499.	NA	

Data of Exogenous Variables in the Pork Supply Model (Continued)

PTDUMPIG = DATE REVISED: 1/21/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: DUMMY FOR DATA REDEFINITION OF BREEDING HOGS.=1 1950-1963
UNITS:

1950	1.	1.	1.	1.
1954	1.	1.	1.	1.
1958	1.	1.	1.	1.
1962	1.	1.	0.	0.
1966	0.	0.	0.	0.
1970	0.	0.	0.	0.
1974	0.	0.	0.	0.
1978	0.	0.	0.	

Statistical Estimates of the Equations in the Pork Model

1) SOWK8 = C1+C2*HOGSNBR(-1)+C3*PTDUMPIG+C4*(BAGPM7C/CORPF+BAGPM7C(-1)/CORPF(-1))

```
NOB = 24        NOVAR = 4
RANGE =  1956 TO 1979
RSQ =    0.87781       CRSQ =    0.85948       F(3/20) =     47.893
SER =    0.4651        SSR =     4.325         DW(0) =  1.33      COND(X) =     37.67
LHS MEAN =      6.54792       SR =       -0.00005
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	2.49713	1.51102	1.65261	1.00000
C2	0.80106	0.15133	5.29350	8.81287
C3	1.12566	0.25026	4.49790	0.33333
C4	-0.10119	0.02368	-4.27241	33.44310

2) PIGSEBR = C1+C2*HUGSNBR(-1)+C3*DUM74+C4*SOWK8+C5*BAGPM7C/CORPF

```
NOB = 24        NOVAR = 5
RANGE =  1956 TO 1979
RSQ =    0.83295       CRSQ =    0.79778       F(4/19) =     23.685
SER =    0.5214        SSR =     5.165         DW(0) =  2.86      COND(X) =     48.65
LHS MEAN =      6.56350       SR =       -0.00004
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	0.37157	2.22880	0.16671	1.00000
C2	-0.33556	0.21066	-1.59291	8.81287
C3	-0.71140	0.66674	-1.06698	0.04167
C4	1.10004	0.17333	6.34642	6.54792
C5	0.11720	0.07352	1.59407	16.85850

Statistical Estimates of the Equations in the Pork Model (Continued)

48 PIGSC = C1+C2*HOGSNBR(-1)+C3*PTDUMPIG+C4*BAGPM7C(-1)/CORPF(-1)

```
NOB = 24        NOVAR = 4
RANGE =   1956 TO 1979
RSQ =     0.8187         CRSQ =    0.7915        F(3/20) =     30.105
SER =     3.1834         SSR =     202.683       DW(0) =   1.41       COND(X) =     36,24
LHS MEAN =       90.08940     SR =         0.00043
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	12.69580	9.22337	1.37648	1.00000
C2	5.76795	1.07584	5.36132	8.81287
C3	5.06340	1.68124	3.01170	0.33333
C4	1.49979	0.26370	5.68738	16.58470

51 BAGKS = C1+C2*HOGSM(-1)+C3*DUM73+C4*BAGPM7C/FARWAG+C5*PIGSC

```
NOB = 24        NOVAR = 5
RANGE =   1956 TO 1979
RSQ =     0.95731        CRSQ =    0.94833       F(4/19) =     106.529
SER =     1.2177         SSR =     28.172        DW(0) =   1.59       COND(X) =     88.15
LHS MEAN =       75.87940     SR =         0.00067
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	20.81910	9.36186	2.22382	1.00000
C2	0.62966	0.10221	6.16070	48.50630
C3	-1.59566	1.48756	-1.07267	0.04167
C4	-0.56112	0.16767	-3.34652	16.15120
C5	0.37348	0.04383	8.52068	90.08940

6) PORAP77 = C1+C2*(1.5*SOWKS+BAGKS)+C3*BAGPM7C(-1)/CORPF(-1)+C4*PORAP77(-1)

```
NOB = 24      NOVAR = 4
RANGE =  1956 TO 1979
RSQ =    0.96341      CRSQ =    0.95792      F(3/20) =    175.520
SER = 200.4770        SSR = 8.038E+05      DW(0) =  1.15     COND(X) =    50.37
LHS MEAN =  13839.20000      SR =       0.125
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	-1154.07000	843.96000	-1.36744	1.00000
C2	142.74000	7.46877	19.11160	85.70120
C3	80.68110	15.72680	5.13017	16.58470
C4	0.10338	0.05246	1.97058	13757.00000

7) PORHT1 = C1+C2*HOGSM+C3*PORHT1(-1)+C4*(BAGPM7C/FARWAG+BAGPM7C(-1)/FARWAG(-1))

```
NOB = 24      NOVAR = 4
RANGE =  1956 TO 1979
RSQ =    0.56085      CRSQ =    0.49497      F(3/20) =       8.514
SER =  34.9839        SSR = 24477.500      DW(0) =  2.06     COND(X) =    68.44
LHS MEAN =    245.29200      SR =       0.00134
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	-593.76700	206.63700	-2.87348	1.00000
C2	11.51730	2.46190	4.67820	48.99390
C3	0.51596	0.15668	3.29317	251.12500
C4	4.46022	2.29507	1.94339	32.55740

FARWAG - DATE REVISED: 3/25/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: ANNUAL AVERAGE HOURLY WAGE RATE
UNITS: $/HR
SOURCE: DATA 1950 THRU 1973 ARE FROM AGRI. STATISTICS 1966, PAGE 449, TABLE 654
AND AGRI. STATISTICS 1976, PAGE 433, TABLE 608, PER HOUR WITHOUT BOARD
OR ROOM RATE.
DATA AFTER 1973 ARE FROM AGRI. STATISTICS 1980, PAGE 433, TABLE 622,
ALL HIRED FARM WORKERS PER HOUR

1950	0.75	0.77	0.81	0.82
1954	0.81	0.82	0.86	0.88
1958	0.92	0.95	0.97	0.99
1962	1.01	1.05	1.08	1.14
1966	1.23	1.33	1.44	1.55
1970	1.64	1.73	1.84	2.
1974	2.29	2.5	2.66	2.87
1978	3.09	3.39	NA	

LAMPRIF - DATE REVISED: 3/20/81
ANNUAL DATA FROM 1956 TO 1980

DESCRIPTION: AVERAGE PRICE RECEIVED BY FARMERS, LAMB AND SHEEP
UNITS: $/100 LB
SOURCE: LIVESTOCK AND MEAT STATISTICS 1973, PAGE 43
AGRICULTURAL STATISTICS 1980, PAGE 329, TABLE 486
COMPUTED: PRICE_OF_SHEEP*SHEEP_MARKETING/(SHEEP_MARKETING+LAMB_
MARKETING) + PRICE_OF_LAMB*LAMB_MARKETING/(SHEEP_
MARKETING+LAMB_MARKETING)

1956	16.7395	18.4105	19.4262	17.206
1960	15.9594	14.0088	15.7576	15.9822
1964	17.5342	20.5136	20.7584	19.3877
1968	21.7993	24.3239	23.8742	23.0281
1972	25.8434	31.3686	32.3534	37.0343
1976	41.7827	44.9018	55.2371	59.8778
1980	NA			

Data of Exogenous Variables in the Lamb and Sheep Supply Model (Continued)

LAMSHID - DATE REVISED: 3/25/81
ANNUAL DATA FROM 1956 TO 1980

DESCRIPTION: NUMBER OF DEATHS, SHEEP AND LAMBS
UNITS: THOUSAND HEAD
SOURCE: LIVESTOCK AND MEAT STATISTICS 1973, PAGE 38
LIVESTOCK AND MEAT STATISTICS 1978, PAGE 36
ADJUSTED FOR CONSISTANCY

1956	4511.	3955.	4802.	5028.
1960	5217.	5091.	4337.	4429.
1964	4088.	3405.	3657.	3711.
1968	3195.	3720.	3356.	3025.
1972	3172.	3032.	3240.	3014.
1976	2522.	2469.	2605.	2561.
1980	NA			

WOOLPRIF - DATE REVISED: 3/20/81
ANNUAL DATA FROM 1956 TO 1979

DESCRIPTION: AVERAGE PRICE OF WOOL RECEIVED BY FARMERS
UNITS: CENTS/LB
SOURCE: AGRICULTURAL STATISTICS 1969, PAGE 342, TABLE 502
AGRICULTURAL STATISTICS 1980, PAGE 335, TABLE 494

1956	44.3	53.4	36.4	43.2
1960	42.	43.	47.7	48.4
1964	53.2	47.1	52.1	39.8
1968	40.5	41.6	35.4	19.6
1972	35.	82.7	59.2	44.7
1976	65.7	72.	74.5	86.3

Statistical Estimates of the Equations in the Lamb and Sheep Model

```
2)  LAMCPOP = C1+C2*LAMSHIST+C3*(LAMPRIF/FARWAG+LAMPRIF(-1)/FARWAG(-1))

NOB = 23       NOVAR = 3
RANGE =   1957 TO 1979
RSQ =     0.997          CRSQ =    0.9967        F(2/20) =   3325.660
SER = 259.7160           SSR = 1.349E+06         DW(0) =   1.59        COND(X) =    21.65
```

COEF	VALUE	ST ER	T-STAT
C1	-153.70800	464.74800	-0.33073
C2	0.61716	0.00852	72.47690
C3	25.82980	15.83880	1.63079

```
3)  LAMSHISL = C1+C2*LAMSHIST+C3*LAMSHISL(-1)+C4*LAMPRIF/CORPF+C5*WOOLPRIF/FARWAG
              +C6*WOOLPRIF(-1)/FARWAG(-1)

NOB = 23       NOVAR = 6
RANGE =   1957 TO 1979
RSQ =     0.99143        CRSQ =    0.9889        F(5/17) =    393.109
SER = 396.9650           SSR = 2.679E+06         DW(0) =   1.60        COND(X) =    41.94
```

COEF	VALUE	ST ER	T-STAT
C1	967.48300	775.93900	1.24685
C2	0.29815	0.03976	7.49924
C3	0.54270	0.08346	6.50246
C4	-61.14760	28.34660	-2.15714
C5	-19.15070	11.56630	-1.65573
C6	-24.61830	11.29310	-2.17994

Statistical Estimates of the Equations in the Lamb and Sheep Model (Continued)

```
4.   WOOLPROD = C1+C2*LAMSHIST

NOB = 23       NOVAR = 2
RANGE =  1957 TO 1979
RSQ =    0.99867       CRSQ =    0.99861       F(1/21) =  1.58E+04
SER = 2.51E+03         SSR = 1.322E+08         DW(0) =  2.29       COND(X) =      6.57

COEF             VALUE           ST ER           T-STAT

C1         -10659.10000     1758.73000        -6.06064
C2              9.27333        0.07384       125.58700


5.   LAMPROD = C1+C2*LAMSHISL+C3*LAMPROD(-1)+C4*(LAMPRIF/CORPF+LAMPRIF(-1)/CORPF(-1))

NOB = 23       NOVAR = 4
RANGE =  1957 TO 1979
RSQ =    0.99638       CRSQ =    0.9958        F(3/19) =  1741.210
SER =   10.4668        SSR =   2081.530        DW(0) =   0.73      COND(X) =     56.08

COEF             VALUE           ST ER           T-STAT

C1             54.51880       25.60070         2.12959
C2              0.04031        0.00297        13.58310
C3              0.07077        0.07649         0.92519
C4              0.30387        0.41483         0.73252
```

BARPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: BARLEY, AVERAGE PRICE RECEIVED BY FARMERS, JUL-JE, US
UNITS: $/BU

1950	1.19	1.26	1.37	1.17
1954	1.09	0.92	0.99	0.887
1958	0.9	0.86	0.84	0.979
1962	0.915	0.897	0.953	1.02
1966	1.06	1.01	0.921	0.885
1970	0.973	0.993	1.21	2.14
1974	2.81	2.42	2.25	1.78
1978	1.92	2.31	NA	

CHIPWBR9 = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: BROILERS, 9-CITY WHOLESALE PRICE, RTC
UNITS: CENTS/LB

1950	45.	47.1	48.	45.4
1954	39.	41.9	33.7	32.3
1958	32.1	29.	29.9	26.1
1962	28.	27.2	25.4	26.5
1966	27.6	25.2	27.2	29.1
1970	26.4	27.2	28.2	42.2
1974	38.3	45.1	40.2	40.8
1978	44.5	44.4	NA	

Data of Exogenous Variables in the Poultry Supply Model (Continued)

CHIPWXB = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: CHICKENS, NONBROILER, WHOLESALE PRICE, US
UNITS: CENTS/LB

1950	22.2	25.	22.1	22.1
1954	16.8	16.6	16.	13.7
1958	14.	11.	12.2	10.1
1962	10.2	10.	9.2	8.9
1966	9.7	7.9	8.2	9.7
1970	9.1	7.7	9.	15.1
1974	9.7	9.9	12.9	12.1
1978	12.4	14.4	NA	

CORPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: CORN, AVERAGE PRICE RECEIVED BY FARMERS, OCT-SEP, US
UNITS: $/BU

1950	1.52	1.66	1.52	1.48
1954	1.43	1.35	1.29	1.11
1958	1.12	1.05	1.	1.1
1962	1.12	1.11	1.17	1.16
1966	1.24	1.03	1.08	1.16
1970	1.33	1.08	1.57	2.55
1974	3.02	2.54	2.15	2.02
1978	2.25	2.36	NA	

Data of Exogenous Variables in the Poultry Supply Model (Continued)

DUM61 = DATE REVISED: 2/10/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: DUMMY VARIABLE, 1961=1, OTHERS=0

1950	0.	0.	0.	0.
1954	0.	0.	0.	0.
1958	0.	0.	0.	1.
1962	0.	0.	0.	0.
1966	0.	0.	0.	0.
1970	0.	0.	0.	0.
1974	0.	0.	0.	0.
1978	0.	0.	0.	

DUM67 = DATE REVISED: 2/10/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: DUMMY VARIABLE, 1967=1, OTHERS=0

1950	0.	0.	0.	0.
1954	0.	0.	0.	0.
1958	0.	0.	0.	0.
1962	0.	0.	0.	0.
1966	0.	1.	0.	0.
1970	0.	0.	0.	0.
1974	0.	0.	0.	0.
1978	0.	0.	0.	

Data of Exogenous Variables in the Poultry Supply Model (Continued)

DUM74 = DATE REVISED: 2/10/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: DUMMY VARIABLE, 1974=1, OTHERS=0

1950	0.	0.	0.	0.
1954	0.	0.	0.	0.
1958	0.	0.	0.	0.
1962	0.	0.	0.	0.
1966	0.	0.	0.	0.
1970	0.	0.	0.	0.
1974	1.	0.	0.	0.
1978	0.	0.	0.	

EGGMI = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: EGG, IMPORTS, US
UNITS: MIL DOZ

1950	NA	NA	NA	NA
1954	NA	NA	NA	NA
1958	NA	NA	2.	2.
1962	1.	1.	2.	0.
1966	14.	4.	5.	9.
1970	27.	10.	1.	13.
1974	13.	5.	3.	14.
1978	11.	10.	NA	

Data of Exogenous Variables in the Poultry Supply Model (Continued)

EGGPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: EGGS, AVERAGE PRICE RECEIVED BY FARMERS, US
UNITS: CENTS/DZ

1950	36.3	47.7	41.6	47.7
1954	36.6	39.5	39.3	35.9
1958	38.5	31.4	36.1	35.6
1962	33.8	34.5	33.8	33.7
1966	39.1	31.3	34.	40.
1970	39.1	31.4	30.9	52.5
1974	53.3	52.5	58.4	55.6
1978	52.2	58.3	NA	

OATPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: OATS, AVERAGE PRICE RECEIVED BY FARMERS, JUL-JE, US
UNITS: $/BU

1950	0.788	0.82	0.789	0.742
1954	0.714	0.6	0.686	0.605
1958	0.578	0.646	0.599	0.642
1962	0.624	0.622	0.631	0.622
1966	0.606	0.659	0.598	0.584
1970	0.623	0.604	0.724	1.18
1974	1.53	1.46	1.56	1.1
1978	1.2	1.36	NA	

Data of Exogenous Variables in the Poultry Supply Model (Continued)

PTTIME = DATE REVISED: 1/21/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: YEAR
UNITS: INDEX

1950	50.	51.	52.	53.
1954	54.	55.	56.	57.
1958	58.	59.	60.	61.
1962	62.	63.	64.	65.
1966	66.	67.	68.	69.
1970	70.	71.	72.	73.
1974	74.	75.	76.	77.
1978	78.	79.	80.	

SUMPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: SOYBEAN MEAL PRICE, US (C.Y.)
UNITS: CENTS/LB

1950	3.222	4.168	3.378	3.952
1954	3.035	2.627	2.373	2.67
1958	2.79	2.778	3.03	3.18
1962	3.565	3.55	3.51	4.075
1966	3.94	3.845	3.705	3.92
1970	3.925	4.51	11.45	7.318
1974	6.542	7.388	9.99	8.21
1978	9.5	9.	NA	

SURPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: SORGHUM, FARM PRICE, OCT YR
UNITS: $/BU

1950	1.053	1.322	1.579	1.322
1954	1.26	0.977	1.148	0.973
1958	0.999	0.858	0.836	1.008
1962	1.019	0.977	1.053	0.984
1966	1.019	0.992	0.949	1.07
1970	1.142	1.042	1.372	2.139
1974	2.772	2.369	2.027	1.82
1978	2.02	2.33	NA	

TURPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: TURKEYS, LIVEWEIGHT, AVERAGE PRICE RECEIVED BY FARMERS, US
UNITS: CENTS/LB

1950	32.9	37.5	33.6	33.7
1954	28.8	30.2	27.2	23.4
1958	23.9	23.9	25.4	18.9
1962	21.6	22.3	21.	22.2
1966	23.1	19.5	20.5	22.4
1970	22.6	22.1	22.2	38.2
1974	28.	34.8	31.7	35.5
1978	43.6	41.1	NA	

Data of Exogenous Variables in the Poultry Supply Model (Continued)

WHEPF = DATE REVISED: 1/22/81
ANNUAL DATA FROM 1950 TO 1980

DESCRIPTION: WHEAT, AVERAGE PRICE RECEIVED BY FARMERS, JUL-JE, US
UNITS: $/BU

1950	2.	2.11	2.09	2.04
1954	2.12	1.98	1.97	1.93
1956	1.75	1.76	1.74	1.83
1962	2.04	1.85	1.37	1.35
1966	1.63	1.39	1.24	1.25
1970	1.33	1.34	1.76	3.95
1974	4.09	3.56	2.73	2.33
1978	2.96	3.82	NA	

Statistical Estimates of the Equations in the Poultry Model

3: CHIAPUT = C1+C2*CHISVLA(-1)+C3*DUM74+C4*(CHIPWXB/FDE+CHIPWXB(-1)/FDE(-1))

NOB = 19 NOVAR = 4
RANGE = 1961 TO 1979
RSQ = 0.70661 CRSQ = 0.64794 F(3/15) = 12.042
SER = 25.4991 SSR = 9753.060 DW(0) = 2.14 COND(X) = 68.16
LHS MEAN = 749.89500 SR = 0.00854

COEF	VALUE	ST ER	T-STAT	MEAN
C1	188.60700	155.20400	1.21522	1.00000
C2	1.67471	0.56689	2.95420	298.38700
C3	70.52740	26.74200	2.63733	0.05263
C4	6.26130	2.81090	2.22751	9.24152

1: CHISPYO = C1+C2*CHIHTYUI(-1)+C3*(CHIPWBR9/FDC+CHIPWBR9(-1)/FDC(-1))+C4*EGGBB(-1)+C5*PTTIME

NOB = 19 NOVAR = 5
RANGE = 1961 TO 1979
RSQ = 0.986 CRSQ = 0.982 F(4/14) = 246.517
SER = 235.7790 SSR = 7.783E+05 DW(0) = 1.14 COND(X) = 150.09
LHS MEAN = 7420.05000 SR = -0.06641

COEF	VALUE	ST ER	T-STAT	MEAN
1	-11905.40000	2459.65000	-4.84027	1.00000
2	-21.06960	6.69337	-3.14783	37.26320
3	34.61940	24.97830	1.38598	24.34000
4	14.64620	3.23796	4.52326	365.73700
5	198.73300	38.05680	5.22200	70.00000

Statistical Estimates of the Equations in the Poultry Model (Continued)

```
5: CHIHTYO1 = C1+C2*CHISPYO+C3*CHIHTOT1+C4*(CHIPWBR9/CHIPWXB+CHIPWBR9(-1)/CHIPWXB(-1))

NOB = 19       NOVAR = 4
RANGE =  1961 TO 1979
RSQ =    0.66857      CRSQ =   0.60228      F(3/15) =      10.086
SER =    6.6857       SSR =    670.472      DW(0) =  1.39      COND(X) =    28.45
LHS MEAN =     37.05260     SR =     -0.00009
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	57.02300	14.92650	3.82026	1.00000
C2	-0.00254	0.00128	-1.98296	7420.05000
C3	0.29659	0.08976	3.30412	99.89470
C4	-4.88345	2.60416	-1.87525	6.29995

```
6: CHIHTOT1 = C1+C2*CHIAPOT+C3*CHIHTYO1(-1)+C4*(CHIPWBR9/CHIPWXB+CHIPWBR9(-1)/CHIPWXB(-1))

NOB = 19       NOVAR = 4
RANGE =  1961 TO 1979
RSQ =    0.41983      CRSQ =   0.3038       F(3/15) =      3.618
SER =  15.3651        SSR =  3541.300       DW(0) =  2.02      COND(X) =    86.47
LHS MEAN =     99.89470     SR =      0.00175
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	-212.14700	116.12800	-1.82683	1.00000
C2	0.39774	0.13293	2.99215	749.89500
C3	-1.26042	0.44488	-2.83316	37.26320
C4	9.64210	5.60267	1.72098	6.29995

Statistical Estimates of the Equations in the Poultry Model (Continued)

```
9) CHISVLA = C1+C2*CHISVLA(-1)+C3*(EGGPF/FDE+EGGPF(-1)/FDE(-1))

NOB = 19      NOVAR = 3
RANGE =  1961 TO 1979
RSQ =    0.88776      CRSQ =    0.87373      F(2/16) =    63.278
SER =    4.7504       SSR =   361.064        DW(0) =  1.09       COND(X) =    63.16
LHS MEAN =    297.35900     SR =       0.00488
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	57.69990	26.77940	2.15463	1.00000
C2	0.73639	0.09947	7.40315	298.38700
C3	0.54905	0.17669	3.10747	36.29920

```
10) EGGAAD = C1+C2*EGGAAD(-1)+C3*CHISVLA+C4*PTTIME

NOB = 19      NOVAR = 4
RANGE =  1961 TO 1979
RSQ =    0.97083      CRSQ =    0.965        F(3/15) =   166.405
SER =    0.1411       SSR =     0.298        DW(0) =  2.06       COND(X) =   360.96
LHS MEAN =    18.65790      SR =       0.00015
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	8.20301	3.52430	2.32756	1.00000
C2	0.40311	0.23639	1.69096	18.52190
C3	-0.00620	0.00412	-1.50463	297.35900
C4	0.06902	0.02794	2.47000	70.00000

Statistical Estimates of the Equations in the Poultry Model (Continued)

12. EGGBB = C1+C2*CHISVLA+C3*CHISPYO+C4*CHISVLA(-1)

```
NOB = 19        NOVAR = 4
RANGE =  1961 TO 1979
RSQ =    0.97357      CRSQ =    0.96829      F(3/15) =    184.187
SER =    9.1349       SSR =  1251.700        DW(0) =  2.18      COND(X) =    151.23
LHS MEAN =     376.73700      SR =        0.01001
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	-73.51140	76.53670	-0.96047	1.00000
C2	1.52483	0.37977	4.01516	297.35900
C3	0.03138	0.00169	18.52240	7420.05000
C4	-0.79095	0.40562	-1.94996	298.38700

13. EGGHT = C1+C2*EGGHT(-1)+C3*CHISVLA+C4*DUM67+C5*(EGGPF/FARWAG-EGGPF(-1)/FARWAG(-1))

```
NOB = 19        NOVAR = 5
RANGE =  1961 TO 1979
RSQ =    0.86468      CRSQ =    0.82602      F(4/14) =    22.365
SER =    6.0198       SSR =   507.340        DW(0) =  1.64      COND(X) =    77.04
LHS MEAN =     39.78950       SR =        0.00076
```

COEF	VALUE	ST ER	T-STAT	MEAN
C1	-77.12760	40.30950	-1.91338	1.00000
C2	0.59243	0.14867	3.98497	41.47370
C3	0.30025	0.14939	2.00985	297.35900
C4	22.68770	7.61084	2.98098	0.05263
C5	-1.77578	0.51014	-3.48096	-1.05362

Statistical Estimates of the Equations in the Poultry Model (Continued)

15: TURAP = C1+C2*TURHT1(-1)+C3*DUM67+C4*(CORPF/TURPF+CORPF(-1)/TURPF(-1))+C5*DUM61+C6*PTTIME

NOB = 19 NOVAR = 6
RANGE = 1961 TO 1979
RSQ = 0.94804 CRSQ = 0.92806 F(5/13) = 47.442
SER = 74.0068 SSR = 71201.100 DW(0) = 1.96 COND(X) = 48.86
LHS MEAN = 1761.11000 SR = -0.01929

COEF	VALUE	ST ER	T-STAT	MEAN
C1	-1568.57000	293.19300	-5.34995	1.00000
C2	-0.57100	0.38443	-1.48533	228.42100
C3	293.32400	78.46030	3.73851	0.05263
C4	-1148.31000	922.97000	-1.24414	0.11890
C5	153.24200	90.23650	1.69823	0.05263
C6	51.04470	4.18010	12.21140	70.00000

16: TURHT1 = C1+C2*TURHT1(-1)+C3*TURAS+C4*CHIHTY01+C5*(TURPF/FARWAG+TURPF(-1)/FARWAG(-1))

NOB = 19 NOVAR = 5
RANGE = 1961 TO 1979
RSQ = 0.73242 CRSQ = 0.65597 F(4/14) = 9.580
SER = 29.8563 SSR = 12479.600 DW(0) = 2.35 COND(X) = 66.44
LHS MEAN = 232.63200 SR = 0.00305

COEF	VALUE	ST ER	T-STAT	MEAN
C1	-631.28200	171.72400	-3.67615	1.00000
C2	0.60842	0.14224	4.27737	228.42100
C3	0.20845	0.05005	4.16438	1989.53000
C4	2.69924	0.81027	3.33127	37.05260
C5	6.56532	2.11297	3.10715	32.01910

Data of Exogenous Variables in the Feed Demand Component

COTMEALP - DATE REVISED: 6/04/81
ANNUAL DATA FROM 1955 TO 1979

DESCRIPTION: COTTON MEAL PRICE
UNITS: $/TON
SOURCE: AGRI. STATISTICS 1966, PAGE 121, TABLE 171
AGRI. STATISTICS 1980, PAGE 115, TABLE 154
THE DATA OF 1979 IS AN EXTRAPOLATED VALUE

1955	51.3	52.1	55.6	60.55
1959	55.65	55.1	59.25	65.6
1963	63.35	59.9	68.8	77.5
1967	77.4	65.2	71.1	72.6
1971	73.9	144.8	138.	123.
1975	141.8	199.2	186.1	161.
1979	169.208			

RAPHIPF - DATE REVISED: 4/09/81
ANNUAL DATA FROM 1954 TO 1980

DESCRIPTION: PRICE RECEIVED BY FARMERS FOR HAY
UNITS: $/TON
SOURCE: AGRI. STATISTICS 1966, PAGE 271, TABLE 397
AGRI. STATISTICS 1980, PAGE 268, TABLE 406

1954	21.9	22.5	22.2	19.3
1958	18.8	22.3	21.7	20.6
1962	21.6	24.6	23.8	23.2
1966	25.	24.5	23.6	24.7
1970	26.1	28.1	31.3	41.6
1974	50.9	52.2	60.3	54.
1978	49.8	59.7	NA	

4 : BARDF = C1+C2*BARPF/LIVIF+C3*SURPF/LIVIF+C4*SOMPF/LIVIF+C5*CORPF/LIVIF+C6*E_GCAU

```
NOB = 19          NOVAR = 6          RANGE: 1961 TO 1979
RSQ = 0.700       CRSQ = 0.585       F(5/13) = 6.069       PROB>F = 0.004
SER = 21.471      SSR = 5993.160     DW(0) = 1.504
COND(X) = 91.921  MAX:HAT = 0.899    RSTUDENT = -2.755     DFFITS = 3.405
```

COEF	ESTIMATE	STER	TSTAT	PROB>|T|
C1	180.4110	78.9671	2.2846	0.0398
C2	-302.8960	75.0075	-4.0382	1.407197E-03
C3	173.9100	141.5710	1.2284	0.2411
C4	-6.3005	4.3312	-1.4547	0.1695
C5	86.6037	93.9742	0.9216	0.3735
C6	0.7641	0.6846	1.1160	0.2846

5 : CORDF = C1+C2*CORPF/LIVIF+C3*SOMPF/LIVIF+C4*E_GCAU+C5*BARPF/LIVIF+C6*DUM7374

```
NOB = 19          NOVAR = 6          RANGE: 1961 TO 1979
RSQ = 0.750       CRSQ = 0.654       F(5/13) = 7.808       PROB>F = 0.001
SER = 275.513     SSR = 986795.000   DW(0) = 1.212
COND(X) = 74.080  MAX:HAT = 0.893    RSTUDENT = 2.382      DFFITS = 1.603
```

COEF	ESTIMATE	STER	TSTAT	PROB>|T|
C1	1016.3800	1580.4000	0.6431	0.5313
C2	-2347.4300	937.2790	-2.5045	0.0264
C3	113.4410	63.9365	1.7743	0.0994
C4	32.7664	10.7352	3.0522	9.260155E-03
C5	967.7260	694.1160	1.3942	0.1866
C6	510.1410	419.9210	1.2148	0.2460

Statistical Estimates of the Equations in the Feed Demand Component (Continued)

6 : SORDF = C1+C2*SORPF/CATPFFD+C3*CORPF/CATPFFD+C4*E_BEEAPFD+C5*SOMPF/CATPFFD

```
NOB = 19          NOVAR = 5        RANGE:  1961 TO 1979
RSQ = 0.865          CRSQ = 0.827        F(4/14) = 22.481     PROB>F = 0.000
SER = 43.152         SSR = 26069.900     DW(0) = 1.428
COND(X) = 70.285     MAX:HAT = 0.719     RSTUDENT = -2.634    DFFITS = -1.710
```

COEF	ESTIMATE	STER	TSTAT	PROB>ITI
C1	421.8340	80.8588	5.2169	1.304884E-04
C2	-30040.2000	5154.6100	-5.8278	4.384972E-05
C3	22081.7000	4603.8400	4.7964	2.845014E-04
C4	0.0306	4.442304E-03	6.8872	7.475775E-06
C5	-383.6520	230.9600	-1.6611	0.1189

7 : WHEDF = C1+C2*WHEPF/CATPFFD+C3*SORPF/CATPFFD+C4*E_BEEAPFD+C5*DUM6467+C6*CORPF/CATPFFD

```
NOB = 19          NOVAR = 6        RANGE:  1961 TO 1979
RSQ = 0.851          CRSQ = 0.794        F(5/13) = 14.895     PROB>F = 0.000
SER = 33.593         SSR = 14670.300     DW(0) = 2.086
COND(X) = 74.217     MAX:HAT = 0.742     RSTUDENT = 2.979     DFFITS = 2.004
```

COEF	ESTIMATE	STER	TSTAT	PROB>ITI
C1	158.3590	68.2612	2.3199	0.0373
C2	-3365.1900	904.4350	-3.7208	2.566446E-03
C3	-8471.6000	4329.8200	-1.9566	0.0722
C4	0.0107	3.972229E-03	2.7015	0.0181
C5	-47.6136	29.0831	-1.6372	0.1256
C6	8228.2600	3687.9800	2.2311	0.0439

8 ; OATDF = C1+C2*OATPF/MILPF+C3*CORPF/MILPF+C4*(E_COWSNMC+E_COWSEMC/0.6)

```
NOB = 19          NOVAR = 4        RANGE:  1961 TO 1979
RSQ = 0.922           CRSQ = 0.906         F(3/15) = 58.901     PROB>F = 0.000
SER = 39.244          SSR = 23101.300      DW(0) = 1.037
COND(X) = 27.435      MAX:HAT = 0.558      RSTUDENT = 2.433     DFFITS = 1.076
```

COEF	ESTIMATE	STER	TSTAT	PROB>|T|
C1	-48.3602	75.3502	-0.6418	0.5307
C2	-3454.2900	695.1800	-4.9689	1.681989E-04
C3	1457.1200	334.8220	4.3519	5.692036E-04
C4	46.6862	3.6055	12.9485	0.0000

9 ; RADFED = C1+C2*E_LIVJF+C3*RAPHIPF/LIVIF+C4*SORPF/LIVIF

```
NOB = 19          NOVAR = 4        RANGE:  1961 TO 1979
RSQ = 0.640           CRSQ = 0.568         F(3/15) = 8.904      PROB>F = 0.001
SER = 4.214           SSR = 266.418        DW(0) = 0.998
COND(X) = 54.827      MAX:HAT = 0.731      RSTUDENT = 4.538     DFFITS = 1.710
```

COEF	ESTIMATE	STER	TSTAT	PROB>|T|
C1	33.4354	18.1601	1.8411	0.0855
C2	92.5984	18.9746	4.8801	1.999411E-04
C3	-0.6395	0.3752	-1.7046	0.1089
C4	11.9801	6.9798	1.7164	0.1067

Statistical Estimates of the Equations in the Feed Demand Component (Continued)

```
10 : SOYBEANM = C1+C2*E_LIVJF+C3*COTMEALP/LIVIF+C4*SOMPF/LIVIF

NOB = 19        NOVAR = 4        RANGE:  1961 TO 1979
RSQ = 0.783         CRSQ = 0.739          F(3/15) = 17.990      PROB>F = 0.000
SER = 1447.670      SSR = 3.143621E07     DW(0) = 1.184
COND(X) = 55.320    MAX:HAT = 0.931       RSTUDENT = 2.580      DFFITS = -1.163
```

COEF	ESTIMATE	STER	TSTAT	PROB>ITI
C1	-31013.9000	6214.3000	-4.9907	1.612292E-04
C2	42903.3000	6638.6400	6.4627	1.069164E-05
C3	31.1353	38.2375	0.8143	0.4282
C4	-788.0580	472.2550	-1.6687	0.1159

```
11 : OILMEALD = C1+C2*SOMPF/LIVIF+C3*COTMEALP/LIVIF+C4*SOYBEANM

NOB = 19        NOVAR = 4        RANGE:  1961 TO 1979
RSQ = 0.627         CRSQ = 0.553          F(3/15) = 8.415       PROB>F = 0.002
SER = 341.007       SSR = 1.744291E06     DW(0) = 1.105
COND(X) = 21.634    MAX:HAT = 0.931       RSTUDENT = -2.450     DFFITS = 2.220
```

COEF	ESTIMATE	STER	TSTAT	PROB>ITI
C1	4226.8600	447.1700	9.4525	0.0000
C2	152.6400	114.9960	1.3273	0.2042
C3	-11.8985	9.2040	-1.2928	0.2157
C4	-0.1228	0. [illegible]	-3.9291	1.339470E-03

APPENDIX TO SECTION III

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10%

OUTPUT

	CUM.MULT.BEEAP	IMP.MULT.BEEAP	CUM.MULT. BEEAPFD	IMP.MULT. BEEAPFD
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	856.955	856.955	-815.288	-815.288
1956	1493.86	636.9	-3039.16	-2223.87
1957	733.719	-760.137	-6123.86	-3084.7
1958	-1242.49	-1976.21	-8755.2	-2631.34
1959	-2824.77	-1582.28	-10714.	-1958.76
1960	-4430.	-1605.23	-12542.5	-1828.58
1961	-6068.27	-1638.27	-14361.7	-1819.15
1962	-7684.87	-1616.6	-16136.9	-1775.22
1963	-9196.18	-1511.3	-17797.9	-1660.99
1964	-10584.2	-1388.04	-19291.6	-1493.65
1965	-11805.6	-1221.4	-20590.9	-1299.32
1966	-12859.8	-1054.18	-21695.5	-1104.61
1967	-13747.3	-887.482	-22611.9	-916.447
1968	-14492.3	-745.032	-23352.3	-740.316
1969	-15099.7	-607.444	-23931.8	-579.55
1970	-15585.9	-486.146	-24370.2	-438.373
1971	-15962.6	-376.712	-24684.4	-314.211
1972	-16249.1	-286.52	-24890.	-205.616
1973	-16453.6	-204.487	-25001.4	-111.402
1974	-16587.9	-134.29	-25032.9	-31.5397
1975	-16661.1	-73.178	-24990.6	36.3141
1976	-16684.4	-23.322	-24902.9	93.6933
1977	-16664.	20.4285	-24761.1	141.842
1978	-16607.1	56.8583	-24579.8	181.31
1979	-16519.4	87.6747	-24366.4	213.4

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT_BEEAPNF	IMP.MULT_BEEAPNF	CUM.MULT_BEEHT	IMP.MULT_BEEHT
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	1672.24	1672.24	26.4634	26.4634
1956	4533.01	2860.77	35.5729	9.1095
1957	6857.58	2324.57	4.25409	-31.3188
1958	7512.71	655.13	-47.406	-51.6601
1959	7889.19	376.48	-71.9185	-24.5125
1960	8112.54	223.353	-101.993	-30.0746
1961	8293.42	180.876	-132.806	-30.8127
1962	8452.04	158.625	-162.543	-29.7367
1963	8601.73	149.684	-189.294	-26.7509
1964	8707.34	105.615	-213.538	-24.2444
1965	8785.26	77.9234	-234.156	-20.6184
1966	8835.7	50.4346	-251.66	-17.5042
1967	8864.66	28.9645	-266.079	-14.4189
1968	8859.95	-4.71649	-278.151	-12.0715
1969	8832.05	-27.8939	-287.732	-9.58128
1970	8784.28	-47.7726	-295.261	-7.52867
1971	8721.78	-62.5008	-300.903	-5.64243
1972	8640.87	-80.9038	-305.108	-4.2047
1973	8547.8	-93.0748	-307.893	-2.78505
1974	8445.05	-102.75	-309.521	-1.62762
1975	8335.56	-109.492	-310.128	-0.607646
1976	8218.54	-117.015	-309.947	0.180847
1977	8097.13	-121.414	-309.029	0.918703
1978	7972.68	-124.452	-307.524	1.50465
1979	7846.95	-125.725	-305.517	2.0074

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT.CALKS	IMP.MULT.CALKS	CUM.MULT.CALSC	IMP.MULT.CALSC
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	8.02393	8.02393	0.	0.
1956	11.2797	3.25572	0.692192	0.692192
1957	12.3198	1.04014	0.191698	-0.500494
1958	12.9449	0.625095	-1.99248	-2.18418
1959	14.0847	1.13984	-3.81599	-1.8235
1960	15.2871	1.20235	-5.38246	-1.56647
1961	16.4106	1.12347	-6.66761	-1.28514
1962	17.3879	0.977316	-7.70748	-1.03987
1963	18.2063	0.818446	-8.53429	-0.826811
1964	18.8739	0.667559	-9.20229	-0.668004
1965	19.4158	0.541899	-9.7081	-0.505807
1966	19.8409	0.42509	-10.0742	-0.366102
1967	20.1619	0.321032	-10.3204	-0.246178
1968	20.392	0.230135	-10.4756	-0.155189
1969	20.5484	0.156341	-10.5425	-0.066913
1970	20.6389	0.090572	-10.5348	0.007686
1971	20.6725	0.033612	-10.4644	0.070417
1972	20.6575	-0.015033	-10.3468	0.117551
1973	20.6037	-0.053795	-10.1857	0.16118
1974	20.5165	-0.08723	-9.98875	0.196897
1975	20.4012	-0.115248	-9.76303	0.22572
1976	20.2629	-0.13832	-9.51686	0.246178
1977	20.1069	-0.156016	-9.25504	0.263811
1978	19.9365	-0.170378	-8.97624	0.276809
1979	19.7551	-0.181426	-8.69027	0.285965

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT. CATKSNF	IMP.MULT. CATKSNF	CUM.MULT. COWKSMC	IMP.MULT. COWKSMC
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	2.48326	2.48326	0.183164	0.183164
1956	7.81949	5.33623	0.183164	0.
1957	12.1555	4.33604	0.183164	0.
1958	13.3776	1.22203	0.183164	0.
1959	14.0798	0.702266	0.235137	0.051972
1960	14.4965	0.416627	0.206646	-0.02849
1961	14.8338	0.337393	0.1787	-0.027947
1962	15.1298	0.295911	0.151304	-0.027396
1963	15.4089	0.279183	0.147525	-0.003779
1964	15.606	0.19701	0.108607	-0.038917
1965	15.7513	0.145356	0.070439	-0.038169
1966	15.8453	0.094041	0.03304	-0.037399
1967	15.8994	0.054028	0.006598	-0.026442
1968	15.8906	-0.008816	-0.034954	-0.041552
1969	15.8386	-0.051994	-0.075701	-0.040747
1970	15.7495	-0.089067	-0.115664	-0.039963
1971	15.633	-0.116533	-0.150287	-0.034622
1972	15.4821	-0.150894	-0.191189	-0.040903
1973	15.3085	-0.173613	-0.231308	-0.040118
1974	15.1168	-0.191698	-0.270649	-0.039341
1975	14.9125	-0.204244	-0.307214	-0.036565
1976	14.6943	-0.21826	-0.346167	-0.038953
1977	14.4677	-0.226511	-0.38435	-0.038183
1978	14.2356	-0.232163	-0.421819	-0.037469
1979	14.001	-0.234536	-0.457656	-0.035837

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT. COWKSNF	IMP.MULT. COWKSNF	CUM.MULT. COWSEMC	IMP.MULT. COWSEMC
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	0.	0.	0.	0.
1956	1.56017	1.56017	0.	0.
1957	3.047	1.48682	0.	0.
1958	2.35233	-0.694672	0.	0.
1959	1.71454	-0.63779	-0.029162	-0.029162
1960	1.12896	-0.585577	-0.057751	-0.028589
1961	0.591314	-0.537646	-0.085768	-0.028017
1962	0.0977	-0.493614	-0.11322	-0.027452
1963	-0.355499	-0.453199	-0.153063	-0.039843
1964	-0.771589	-0.41609	-0.192129	-0.039066
1965	-1.15362	-0.382033	-0.230425	-0.038296
1966	-1.50438	-0.350759	-0.267972	-0.037547
1967	-1.82644	-0.322056	-0.310527	-0.042556
1968	-2.12211	-0.295671	-0.352256	-0.041729
1969	-2.39358	-0.271476	-0.393173	-0.040917
1970	-2.64282	-0.249237	-0.433291	-0.040118
1971	-2.87167	-0.228849	-0.47519	-0.041899
1972	-3.08182	-0.21015	-0.516283	-0.041093
1973	-3.27478	-0.192962	-0.556585	-0.040302
1974	-3.45194	-0.17716	-0.59611	-0.039525
1975	-3.61458	-0.162635	-0.636003	-0.039892
1976	-3.76389	-0.149312	-0.675125	-0.039122
1977	-3.90099	-0.137105	-0.713499	-0.038374
1978	-4.02668	-0.125867	-0.75113	-0.037632
1979	-4.14247	-0.115587	-0.788543	-0.037413

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT. COWSNBE	IMP.MULT. COWSNBE	CUM.MULT. COWSNMC	IMP.MULT. COWSNMC
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	0.	0.	0.	0.
1956	1.14702	1.14702	-0.183108	-0.183108
1957	0.714007	-0.433016	-0.362599	-0.179491
1958	-2.12823	-2.84224	-0.538472	-0.175874
1959	-4.73774	-2.60951	-0.710842	-0.17237
1960	-7.13363	-2.39589	-0.960977	-0.250134
1961	-9.33341	-2.19978	-1.20625	-0.245274
1962	-11.353	-2.01961	-1.44666	-0.240414
1963	-13.2073	-1.85425	-1.6824	-0.235737
1964	-14.9097	-1.70245	-1.94955	-0.267152
1965	-16.4728	-1.56308	-2.21152	-0.261967
1966	-17.9079	-1.43513	-2.46836	-0.256838
1967	-19.2256	-1.3177	-2.7202	-0.251844
1968	-20.4354	-1.20975	-2.98323	-0.263027
1969	-21.5461	-1.11074	-3.2412	-0.257976
1970	-22.5659	-1.01975	-3.49422	-0.253016
1971	-23.5022	-0.936336	-3.74233	-0.248107
1972	-24.362	-0.859815	-3.99275	-0.250424
1973	-25.1515	-0.789511	-4.23836	-0.245606
1974	-25.8764	-0.724858	-4.47923	-0.240873
1975	-26.5418	-0.665404	-4.71547	-0.236239
1976	-27.1527	-0.610924	-4.95032	-0.234847
1977	-27.7137	-0.560965	-5.18064	-0.230326
1978	-28.2288	-0.515075	-5.40655	-0.225911
1979	-28.7017	-0.472915	-5.6281	-0.221552

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT_ CONYILD	IMP.MULT_ CONYILD	CUM.MULT_HAFCAV	IMP.MULT_HAFCAV
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	-0.171671	-0.171671	0.	0.
1956	-0.267604	-0.095934	-10.2383	-10.2383
1957	-0.315974	-0.04837	-23.6186	-13.3803
1958	-0.334567	-0.018593	-35.3958	-11.7772
1959	-0.331855	0.002713	-47.4642	-12.0684
1960	-0.313169	0.018685	-60.4277	-12.9635
1961	-0.284728	0.028441	-73.9681	-13.5404
1962	-0.250459	0.034269	-87.6248	-13.6568
1963	-0.211619	0.03884	-101.026	-13.4027
1964	-0.168986	0.042633	-113.928	-12.9008
1965	-0.124304	0.044682	-126.227	-12.2984
1966	-0.078676	0.045629	-137.875	-11.6486
1967	-0.032256	0.04642	-148.855	-10.9795
1968	0.014885	0.04714	-159.163	-10.3082
1969	0.062138	0.047253	-168.83	-9.66665
1970	0.10913	0.046992	-177.886	-9.05592
1971	0.155868	0.046738	-186.359	-8.47291
1972	0.202365	0.046497	-194.275	-7.91602
1973	0.248375	0.04601	-201.666	-7.39348
1974	0.293764	0.045388	-208.57	-6.90226
1975	0.338544	0.044781	-215.009	-6.4385
1976	0.382746	0.044202	-221.009	-5.9996
1977	0.426269	0.043523	-226.597	-5.58795
1978	0.469072	0.042803	-231.797	-5.20094
1979	0.511169	0.042096	-236.634	-4.83676

EXOGENOUS PERTURBATIONS: 1 PÉRIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT_HEISBBE	IMP.MULT_HEISBBE	CUM.MULT_MILAP	IMP.MULT_MILAP
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	1.14699	1.14699	-4.05098	-4.05098
1956	1.15001	0.003024	-7.08661	-3.03563
1957	0.219002	-0.93101	-9.16228	-2.07567
1958	-0.299818	-0.518819	-10.6586	-1.49628
1959	-0.776159	-0.476341	-12.0639	-1.4053
1960	-1.2135	-0.437339	-13.5154	-1.45152
1961	-1.61505	-0.401551	-14.827	-1.31159
1962	-1.98371	-0.36866	-16.0801	-1.25316
1963	-2.32218	-0.338474	-17.4377	-1.3576
1964	-2.63295	-0.310767	-18.8955	-1.45774
1965	-2.91827	-0.285322	-20.3513	-1.45582
1966	-3.18024	-0.261967	-21.8441	-1.49278
1967	-3.42077	-0.240534	-23.4581	-1.61406
1968	-3.6416	-0.220824	-25.1719	-1.71375
1969	-3.84435	-0.202754	-26.9192	-1.74732
1970	-4.0305	-0.186145	-28.6958	-1.7766
1971	-4.20141	-0.170915	-30.5549	-1.85911
1972	-4.35837	-0.156956	-32.4449	-1.88997
1973	-4.50249	-0.14412	-34.3423	-1.89743
1974	-4.63481	-0.132322	-36.2467	-1.90443
1975	-4.75627	-0.121457	-38.1525	-1.90579
1976	-4.86778	-0.111518	-40.0926	-1.94004
1977	-4.97018	-0.102398	-42.0793	-1.98672
1978	-5.00421	-0.094026	-44.1161	-2.03679
1979	-5.15053	-0.086326	-46.2094	-2.09351

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT_MILAP2	IMP.MULT_MILAP2	CUM.MULT_SAHKS	IMP.MULT_SAHKS
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	-2.28557	-2.28557	1.06734	1.06734
1956	-5.11673	-2.83116	1.64288	0.575546
1957	-7.293	-2.17627	-0.569782	-2.21266
1958	-8.84964	-1.55664	-2.56905	-1.99926
1959	-10.0832	-1.2336	-4.13168	-1.56263
1960	-11.3065	-1.2232	-5.85775	-1.72607
1961	-12.5531	-1.2466	-7.72036	-1.86261
1962	-13.7037	-1.15064	-9.59552	-1.87516
1963	-14.8342	-1.13052	-11.3642	-1.76868
1964	-16.0489	-1.21473	-12.9524	-1.58818
1965	-17.3213	-1.27237	-14.3261	-1.37376
1966	-18.5858	-1.26446	-15.487	-1.16081
1967	-19.8777	-1.29193	-16.4424	-0.955438
1968	-21.2513	-1.37365	-17.2065	-0.764079
1969	-22.6824	-1.43107	-17.7969	-0.590466
1970	-24.1285	-1.4461	-18.2365	-0.439572
1971	-25.5917	-1.46317	-18.5437	-0.307214
1972	-27.1062	-1.51448	-18.7355	-0.191811
1973	-28.6342	-1.52804	-18.8274	-0.091893
1974	-30.1609	-1.52669	-18.8353	-0.007912
1975	-31.6879	-1.52703	-18.772	0.063296
1976	-33.2121	-1.5242	-18.6486	0.123428
1977	-34.7523	-1.54014	-18.4749	0.173726
1978	-36.3167	-1.56444	-18.2602	0.214643
1979	-37.9085	-1.59179	-18.0125	0.247761

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT_SAHKSFD	IMP.MULT_SAHKSFD	CUM.MULT_VEAAT	IMP.MULT_VEAAT
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	-1.23288	-1.23288	960.184	960.184
1956	-4.43333	-3.20045	1127.9	167.718
1957	-9.49522	-5.0619	1213.61	85.7107
1958	-13.4112	-3.91598	1268.61	54.9974
1959	-16.2619	-2.85073	1392.3	123.692
1960	-19.0187	-2.75679	1507.6	115.297
1961	-21.7843	-2.7656	1615.4	107.798
1962	-24.4765	-2.69214	1707.44	92.0403
1963	-26.9813	-2.50485	1784.11	76.6702
1964	-29.2214	-2.24013	1846.28	62.168
1965	-31.1608	-1.93936	1896.76	50.4799
1966	-32.8038	-1.643	1935.96	39.204
1967	-34.1618	-1.35805	1965.32	29.3587
1968	-35.2543	-1.09243	1986.07	20.754
1969	-36.105	-0.850773	1999.98	13.9126
1970	-36.7448	-0.639747	2007.61	7.62271
1971	-37.1989	-0.454152	2009.87	2.26059
1972	-37.4909	-0.291955	2007.55	-2.32208
1973	-37.6422	-0.151346	2001.65	-5.90104
1974	-37.6749	-0.032666	1992.57	-9.07491
1975	-37.6066	0.06827	1980.87	-11.6954
1976	-37.4531	0.153494	1967.03	-13.8475
1977	-37.2281	0.225042	1951.56	-15.4697
1978	-36.9447	0.283365	1934.74	-16.8152
1979	-36.6139	0.330837	1916.92	-17.8243

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CATPFFD FROM CURRENT PERIOD BY 10%
CATPFNF FROM CURRENT PERIOD BY 10%
CATPFFE FROM CURRENT PERIOD BY 10%
CALPF FROM CURRENT PERIOD BY 10%

OUTPUT

	DELTA_BEEAP	CUM_DELTA_BEEAP	DELTA_BEEAPFD	CUM_DELTA_BEEAPFD
1953	0.	0.	0.	0.
1954	0.	0.	0.	0.
1955	-25.8672	-25.8672	134.465	134.465
1956	-168.293	-194.16	368.758	503.223
1957	61.6523	-132.508	396.93	900.152
1958	217.305	84.7969	295.578	1195.73
1959	203.012	287.809	204.391	1400.12
1960	136.383	424.191	207.551	1607.67
1961	207.887	632.078	226.906	1834.58
1962	202.441	834.52	217.574	2052.15
1963	209.453	1043.97	208.84	2260.99
1964	160.312	1204.29	194.637	2455.63
1965	164.574	1368.86	174.637	2630.27
1966	138.355	1507.21	144.082	2774.35
1967	123.418	1630.63	119.59	2893.94
1968	88.5898	1719.22	98.1016	2992.04
1969	81.043	1800.27	78.2227	3070.26
1970	62.5859	1862.85	56.6875	3126.95
1971	50.8789	1913.73	39.9687	3166.92
1972	31.5977	1945.33	26.1094	3193.03
1973	25.3242	1970.65	14.0703	3207.1
1974	14.8828	1985.54	2.14453	3209.24
1975	7.96484	1993.5	-7.00391	3202.24
1976	-1.87891	1991.62	-14.3672	3187.87
1977	-5.60156	1986.02	-20.4922	3167.38
1978	-10.8789	1975.14	-26.2266	3141.15
1979	-14.3711	1960.77	-30.4531	3110.7

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CATPFFD FROM CURRENT PERIOD BY 10%
CATPFNF FROM CURRENT PERIOD BY 10%
CATPFFE FROM CURRENT PERIOD BY 10%
CALPF FROM CURRENT PERIOD BY 10% (Continued)

	DELTA_BEEAPNF	CUM_DELTA_BEEAPNF	DELTA_BEEHT	CUM_DELTA_BEEHT
1953	0.	0.	0.	0.
1954	0.	0.	0.	0.
1955	-160.332	-160.332	-0.798828	-0.798828
1956	-537.051	-697.383	-4.8781	-5.67693
1957	-335.277	-1032.66	3.97743	-1.69949
1958	-78.2734	-1110.93	5.9509	4.2514
1959	-1.37891	-1112.31	3.59186	7.84326
1960	-71.168	-1183.48	1.71057	9.55383
1961	-19.0195	-1202.5	4.7395	14.2933
1962	-15.1328	-1217.63	3.69043	17.9838
1963	0.613281	-1217.02	3.97388	21.9576
1964	-34.3242	-1251.34	2.36987	24.3275
1965	-10.0625	-1261.41	3.10693	27.4344
1966	-5.72656	-1267.13	2.24487	29.6793
1967	3.82813	-1263.3	2.10693	31.7863
1968	-9.51172	-1272.82	1.21533	33.0016
1969	2.82031	-1270.	1.41113	34.4127
1970	5.89844	-1264.1	0.934326	35.347
1971	10.9102	-1253.19	0.800293	36.1473
1972	5.48828	-1247.7	0.349121	36.4965
1973	11.2561	-1236.44	0.392822	36.8893
1974	12.7383	-1223.7	0.147705	37.037
1975	14.9687	-1208.74	0.0625	37.0995
1976	12.4883	-1196.25	-0.15625	36.9432
1977	14.8906	-1181.36	-0.149658	36.7936
1978	15.3477	-1166.01	-0.26709	36.5265
1979	16.082	-1149.93	-0.309814	36.2167

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CATPFFD FROM CURRENT PERIOD BY 10%
CATPFNF FROM CURRENT PERIOD BY 10%
CATPFFE FROM CURRENT PERIOD BY 10%
CALPF FROM CURRENT PERIOD BY 10% (Continued)

	DELTA_CALKS	CUM_DELTA_CALKS	DELTA_CALSC	CUM_DELTA_CALSC
1953	0.	0.	0.	0.
1954	0.	0.	0.	0.
1955	-0.984747	-0.984747	0.	0.
1956	-0.399559	-1.38431	-0.275833	-0.275833
1957	-0.050205	-1.43451	0.070175	-0.205658
1958	-0.048842	-1.48335	0.320953	0.115295
1959	-0.150045	-1.6334	0.268082	0.383377
1960	-0.169653	-1.80305	0.153824	0.537201
1961	-0.131248	-1.9343	0.187378	0.724579
1962	-0.129280	-2.06359	0.151794	0.876373
1963	-0.114049	-2.17764	0.120865	0.997238
1964	-0.095321	-2.27296	0.06395	1.06119
1965	-0.064625	-2.33758	0.073578	1.13477
1966	-0.056074	-2.39365	0.053497	1.18826
1967	-0.044459	-2.43811	0.036285	1.22455
1968	-0.032763	-2.47088	0.008255	1.2328
1969	-0.016642	-2.48752	0.010284	1.24309
1970	-0.010928	-2.49845	-0.00032	1.24277
1971	-0.004303	-2.50275	-0.009201	1.23357
1972	0.001984	-2.50077	-0.022507	1.21106
1973	0.009937	-2.49083	-0.022141	1.18892
1974	0.013021	-2.47781	-0.027084	1.16183
1975	0.016277	-2.46153	-0.031036	1.1308
1976	0.019199	-2.44233	-0.036743	1.09406
1977	0.022697	-2.41963	-0.03627	1.05779
1978	0.023923	-2.39571	-0.037994	1.01979
1979	0.025125	-2.37059	-0.039169	0.980621

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CATPFFD FROM CURRENT PERIOD BY 10%
CATPFNF FROM CURRENT PERIOD BY 10%
CATPFFE FROM CURRENT PERIOD BY 10%
CALPF FROM CURRENT PERIOD BY 10% (Continued)

	DELTA_CATKSNF	CUM_DELTA_CATKSNF	DELTA_COWKSMC	CUM_DELTA_COWKSMC
1953	0.	0.	0.	0.
1954	0.	0.	0.	0.
1955	-0.20462	-0.20462	0.136966	0.136966
1956	-1.00177	-1.20639	-0.209355	-0.07239
1957	-0.625397	-1.83179	0.	-0.07239
1958	-0.146007	-1.97779	0.	-0.07239
1959	-0.002569	-1.98036	0.060693	-0.011697
1960	-0.132751	-2.11311	-0.092719	-0.104416
1961	-0.035477	-2.14859	-2.956390E-05	-0.104445
1962	-0.028229	-2.17682	-3.051758E-05	-0.104476
1963	0.001144	-2.17568	0.026877	-0.077599
1964	-0.064026	-2.2397	-0.041089	-0.118688
1965	-0.018768	-2.25847	-5.340576E-05	-0.118741
1966	-0.010681	-2.26915	-5.054474E-05	-0.118792
1967	0.007141	-2.26201	0.011875	-0.106916
1968	-0.017746	-2.27976	-0.018239	-0.125155
1969	0.005264	-2.27449	-6.675720E-05	-0.125222
1970	0.011002	-2.26349	-6.866455E-05	-0.125291
1971	0.020355	-2.24313	0.00522	-0.12007
1972	0.010239	-2.2329	-0.008118	-0.128188
1973	0.020996	-2.2119	-7.057190E-05	-0.128259
1974	0.023758	-2.18814	-7.343292E-05	-0.128332
1975	0.027924	-2.16022	0.002271	-0.126061
1976	0.0233	-2.13692	-0.003637	-0.129699
1977	0.027771	-2.10915	-7.438660E-05	-0.129773
1978	0.028625	-2.08052	-7.534027E-05	-0.129848
1979	0.029999	-2.05052	0.000966	-0.128882

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CATPFFD FROM CURRENT PERIOD BY 10%
CATPFNF FROM CURRENT PERIOD BY 10%
CATPFFE FROM CURRENT PERIOD BY 10%
CALPF FROM CURRENT PERIOD BY 10% (Continued)

	DELTA_COWKSNF	CUM_DELTA_COWKSNF	DELTA_COWSEMC	CUM_DELTA_COWSEMC
1953	0.	0.	0.	0.
1954	0.	0.	0.	0.
1955	0.	0.	-0.076857	-0.076857
1956	-0.231679	-0.231679	0.	-0.076857
1957	-0.220789	-0.452468	0.	-0.076857
1958	0.103159	-0.349309	0.	-0.076857
1959	0.094716	-0.254593	-0.034057	-0.110913
1960	0.086962	-0.167631	-2.861023E-05	-0.110942
1961	0.079846	-0.087785	-2.670288E-05	-0.110969
1962	0.073309	-0.014476	-2.384186E-05	-0.110992
1963	0.067301	0.052825	-0.015119	-0.126111
1964	0.061793	0.114618	-5.340576E-05	-0.126164
1965	0.056732	0.17135	-5.149841E-05	-0.126216
1966	0.052089	0.223439	-5.054474E-05	-0.126266
1967	0.047822	0.271261	-0.006741	-0.133007
1968	0.04391	0.315171	-6.866455E-05	-0.133076
1969	0.040315	0.355486	-6.771088E-05	-0.133143
1970	0.037014	0.3925	-6.484985E-05	-0.133208
1971	0.033982	0.426482	-0.003029	-0.136237
1972	0.031197	0.457679	-7.438660E-05	-0.136312
1973	0.028642	0.48632	-7.438660E-05	-0.136386
1974	0.026297	0.512617	-7.247925E-05	-0.136458
1975	0.02414	0.536757	-0.001385	-0.137843
1976	0.022164	0.558922	-7.629395E-05	-0.137919
1977	0.020344	0.579266	-7.534027E-05	-0.137995
1978	0.018677	0.597942	-7.343292E-05	-0.138068
1979	0.017143	0.615086	-0.000654	-0.138722

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CATPFFD FROM CURRENT PERIOD BY 10%
CATPFNF FROM CURRENT PERIOD BY 10%
CATPFFE FROM CURRENT PERIOD BY 10%
CALPF FROM CURRENT PERIOD BY 10% (Continued)

	DELTA_COWSNBE	CUM_DELTA_COWSNBE	DELTA_COWSNMC	CUM_DELTA_COWSNMC
1953	0.	0.	0.	0.
1954	0.	0.	0.	0.
1955	0.	0.	0.	0.
1956	-0.170319	-0.170319	-0.213806	-0.213806
1957	0.064316	-0.106003	-0.000183	-0.213989
1958	0.422073	0.316071	-0.000168	-0.214157
1959	0.387527	0.703598	-0.000153	-0.21431
1960	0.355804	1.0594	-0.09491	-0.309219
1961	0.326691	1.38609	-0.000336	-0.309555
1962	0.299942	1.68604	-0.00032	-0.309875
1963	0.27536	1.9614	-0.00032	-0.310196
1964	0.252823	2.21422	-0.042319	-0.352515
1965	0.232117	2.44633	-0.00043	-0.352945
1966	0.21312	2.65945	-0.00042	-0.353365
1967	0.195663	2.85512	-0.000407	-0.353772
1968	0.179657	3.03477	-0.019016	-0.372788
1969	0.164948	3.19972	-0.000468	-0.373257
1970	0.151443	3.35117	-0.000467	-0.373724
1971	0.139038	3.4902	-0.000454	-0.374178
1972	0.12764	3.61784	-0.008695	-0.382873
1973	0.117188	3.73503	-0.000477	-0.383349
1974	0.10759	3.84262	-0.000471	-0.383821
1975	0.09877	3.94139	-0.000461	-0.384281
1976	0.090683	4.03207	-0.004107	-0.388389
1977	0.083237	4.11531	-0.000464	-0.388853
1978	0.076416	4.19173	-0.000456	-0.389309
1979	0.070145	4.26187	-0.000444	-0.389753

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CATPFFD FROM CURRENT PERIOD BY 10%
CATPFNF FROM CURRENT PERIOD BY 10%
CATPFFE FROM CURRENT PERIOD BY 10%
CALPF FROM CURRENT PERIOD BY 10% (Continued)

	DELTA_COWYILD	CUM_DELTA_COWYILD	DELTA_HAFCAV	CUM_DELTA_HAFCAV
1953	0.	0.	0.	0.
1954	0.	0.	0.	0.
1955	0.007252	0.007252	0.	0.
1956	0.011979	0.019231	1.39041	1.39041
1957	0.007573	0.026804	1.60008	2.99049
1958	0.004792	0.031596	1.31863	4.30913
1959	0.006248	0.037844	1.43034	5.73947
1960	0.007238	0.045082	1.6763	7.41577
1961	0.004592	0.049674	1.7455	9.16127
1962	0.002921	0.052595	1.77094	10.9322
1963	0.003289	0.055884	1.76961	12.7018
1964	0.003554	0.059439	1.7464	14.4482
1965	0.002272	0.06171	1.65094	16.0992
1966	0.001462	0.063172	1.56044	17.6596
1967	0.00158	0.064753	1.48056	19.1402
1968	0.00167	0.066422	1.40764	20.5478
1969	0.001085	0.067508	1.31424	21.862
1970	0.000716	0.068224	1.23091	23.0929
1971	0.000762	0.068986	1.15776	24.2507
1972	0.000797	0.069783	1.09174	25.3424
1973	0.000535	0.070318	1.01979	26.3622
1974	0.00037	0.070688	0.954849	27.3171
1975	0.000388	0.071076	0.896667	28.2137
1976	0.000402	0.071479	0.843597	29.0573
1977	0.000286	0.071765	0.789673	29.847
1978	0.000211	0.071976	0.740448	30.5875
1979	0.000218	0.072194	0.695633	31.2831

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CATPFFD FROM CURRENT PERIOD BY 10%
CATPFNF FROM CURRENT PERIOD BY 10%
CATPFFE FROM CURRENT PERIOD BY 10%
CALPF FROM CURRENT PERIOD BY 10% (Continued)

	DELTA_HEISBBE	CUM_DELTA_HEISBBE	DELTA_MILAP	CUM_DELTA_MILAP
1953	0.	0.	0.	0.
1954	0.	0.	0.	0.
1955	-0.170326	-0.170326	-0.478622	-0.478622
1956	-0.000447	-0.170774	-0.42009	-0.898712
1957	0.138257	-0.032516	0.147324	-0.751389
1958	0.077045	0.044529	0.088181	-0.663208
1959	0.070739	0.115268	-0.213104	-0.876312
1960	0.064949	0.180217	-0.218399	-1.09471
1961	0.059634	0.239851	0.076736	-1.01797
1962	0.054751	0.294602	0.045853	-0.972122
1963	0.050264	0.344867	-0.113586	-1.08571
1964	0.04615	0.391017	-0.117706	-1.20341
1965	0.042371	0.433388	0.031387	-1.17203
1966	0.038903	0.472291	0.01796	-1.15407
1967	0.035717	0.508008	-0.062408	-1.21648
1968	0.032795	0.540803	-0.066071	-1.28255
1969	0.03011	0.570913	0.010559	-1.27199
1970	0.027644	0.598557	0.00502	-1.26697
1971	0.02538	0.623938	-0.034836	-1.3018
1972	0.023299	0.647237	-0.036072	-1.33788
1973	0.021391	0.668628	0.001678	-1.3362
1974	0.019639	0.688267	-0.000534	-1.33673
1975	0.01803	0.706297	-0.018753	-1.35548
1976	0.016554	0.722851	-0.019608	-1.37509
1977	0.015194	0.738045	-0.001694	-1.37679
1978	0.013948	0.751993	-0.002625	-1.37941
1979	0.012804	0.764797	-0.012039	-1.39145

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CATPFFD FROM CURRENT PERIOD BY 10%
CATPFNF FROM CURRENT PERIOD BY 10%
CATPFFE FROM CURRENT PERIOD BY 10%
CALPF FROM CURRENT PERIOD BY 10% (Continued)

	DELTA_MILAP2	CUM_DELTA_MILAP2	DELTA_SAHKS	CUM_DELTA_SAHKS
1953	0.	0.	0.	0.
1954	0.	0.	0.	0.
1955	-0.138123	-0.138123	-0.158493	-0.158493
1956	-0.447556	-0.585678	-0.08548	-0.243973
1957	-0.269318	-0.854996	0.263565	0.019592
1958	0.094147	-0.760849	0.181046	0.200638
1959	-0.004929	-0.765778	0.135483	0.336121
1960	-0.199234	-0.965012	0.189346	0.525467
1961	-0.140305	-1.10532	0.233597	.759064
1962	0.048737	-1.05658	0.227692	0.986755
1963	0.001816	-1.05476	0.222992	1.20975
1964	-0.100922	-1.15569	0.208633	1.41838
1965	-0.075958	-1.23164	0.186386	1.60477
1966	0.019562	-1.21208	0.150604	1.75537
1967	-0.001038	-1.21312	0.12468	1.88005
1968	-0.05278	-1.2659	0.101685	1.98174
1969	-0.042908	-1.30881	0.080215	2.06195
1970	0.006149	-1.30266	0.056168	2.11812
1971	-0.002686	-1.30534	0.038757	2.15688
1972	-0.028366	-1.33371	0.024231	2.18111
1973	-0.023712	-1.35742	0.01152	2.19263
1974	0.000443	-1.35698	-0.001495	2.19113
1975	-0.003281	-1.36026	-0.010895	2.18024
1976	-0.015015	-1.37527	-0.018494	2.16174
1977	-0.013138	-1.38841	-0.024857	2.13689
1978	-0.001648	-1.39006	-0.030975	2.10591
1979	-0.003296	-1.39336	-0.035248	2.07066

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CATPFFD FROM CURRENT PERIOD BY 10%
CATPFNF FROM CURRENT PERIOD BY 10%
CATPFFE FROM CURRENT PERIOD BY 10%
CALPF FROM CURRENT PERIOD BY 10% (Continued)

	DELTA_SAHKSFD	CUM_DELTA_SAHKSFD	DELTA_VEAAT	CUM_DELTA_VEAAT
1953	0.	0.	0.	0.
1954	0.	0.	0.	0.
1955	0.18308	0.18308	-117.84	-117.84
1956	0.475262	0.658541	-20.5828	-138.422
1957	0.668164	1.32651	-1.25171	-139.674
1958	0.430217	1.75672	-5.55542	-145.229
1959	0.293447	2.05017	-16.6714	-161.901
1960	0.316345	2.36652	-16.4492	-178.35
1961	0.348892	2.71541	-11.9048	-190.255
1962	0.329193	3.0446	-12.72	-202.975
1963	0.316025	3.36063	-10.7085	-213.683
1964	0.293365	3.65399	-8.93188	-222.615
1965	0.261626	3.91582	-5.66943	-228.285
1966	0.213333	4.12915	-5.3999	-233.685
1967	0.177231	4.30638	-4.07227	-237.757
1968	0.145111	4.45149	-2.97974	-240.737
1969	0.115189	4.56668	-1.30273	-242.039
1970	0.082108	4.64879	-1.00684	-243.046
1971	0.057602	4.70639	-0.282227	-243.328
1972	0.037064	4.74345	0.30249	-243.026
1973	0.019104	4.76256	1.11938	-241.906
1974	0.000977	4.76353	1.29956	-240.607
1975	-0.012405	4.75113	1.64746	-238.959
1976	-0.02327	4.72786	1.91699	-237.042
1977	-0.032349	4.69551	2.27319	-234.769
1978	-0.041	4.65451	2.3374	-232.432
1979	-0.047134	4.60738	2.46655	-229.965

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
MILPF FROM CURRENT PERIOD BY 10%

OUTPUT

	CUM.MULT_BEEAP	IMP.MULT_BEEAP	CUM.MULT_ BEEAPFD	IMP.MULT_ BEEAPFD
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	-237.806	-237.806	0.	0.
1956	70.0695	307.875	0.	0.
1957	70.0695	0.	0.	0.
1958	158.336	88.2663	110.779	110.779
1959	156.144	-2.1918	232.828	122.049
1960	374.019	217.875	329.101	96.2737
1961	431.415	57.396	396.024	66.923
1962	509.209	77.7943	488.918	92.8934
1963	534.225	25.0158	570.764	81.8467
1964	648.51	114.285	630.625	59.8605
1965	686.472	37.962	670.652	40.0272
1966	730.123	43.6509	717.732	47.0799
1967	748.135	18.0117	757.	39.2673
1968	804.118	55.9835	784.509	27.5095
1969	825.13	21.0121	801.751	17.2422
1970	847.76	22.6291	821.	19.2489
1971	858.29	10.5304	835.924	14.9237
1972	885.02	26.7302	844.915	8.99126
1973	895.775	10.7544	848.782	3.86731
1974	906.802	11.0272	853.078	4.29593
1975	912.072	5.27007	855.065	1.98723
1976	924.209	12.1377	854.091	-0.974134
1977	928.993	4.783	850.565	-3.52637
1978	933.629	4.63688	847.	-3.56533
1979	935.5	1.87034	842.217	-4.783

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
MILPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT_ BEEAPNF	IMP.MULT_ BEEAPNF	CUM.MULT_BEEHT	IMP.MULT_BEEHT
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	-237.806	-237.806	-7.34314	-7.34314
1956	70.0695	307.875	5.09358	12.4367
1957	70.0695	0.	1.30058	-3.793
1958	47.5572	-22.5122	4.02633	2.72575
1959	-76.6838	-124.241	2.87134	-1.15499
1960	44.9173	121.601	9.62658	6.75524
1961	35.3903	-9.52703	8.71515	-0.911424
1962	20.2912	-15.0991	10.4108	1.6956
1963	-36.5398	-56.831	10.2251	-0.185694
1964	17.8851	54.4249	13.4452	3.22012
1965	15.8199	-2.06516	13.209	-0.236228
1966	12.391	-3.42895	14.0893	0.880374
1967	-8.86462	-21.2556	14.1082	0.018874
1968	19.6093	28.4739	15.6157	1.50747
1969	23.3792	3.7699	15.5749	-0.040792
1970	26.7595	3.38025	16.0145	0.439578
1971	22.3661	-4.39334	16.0607	0.046271
1972	40.1051	17.739	16.7566	0.695897
1973	47.0001	6.89504	16.759	0.002435
1974	53.7314	6.73127	16.9673	0.208221
1975	57.0142	3.28283	16.9935	0.02618
1976	70.1261	13.1118	17.3034	0.309896
1977	78.4354	8.30936	17.3015	-0.001827
1978	86.6376	8.20221	17.3855	0.084019
1979	93.291	6.65334	17.3862	0.000609

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
MILPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT_CALKS	IMP.MULT_CALKS	CUM.MULT_CALSC	IMP.MULT_CALSC
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	0.	0.	0.	0.
1956	0.	0.	0.469905	0.469905
1957	-0.190665	-0.190665	0.476907	0.007002
1958	-0.270874	-0.080209	0.482349	0.005441
1959	-0.30563	-0.034756	0.486382	0.004034
1960	-0.321364	-0.015735	0.697381	0.210999
1961	-0.413355	-0.091991	0.70229	0.004909
1962	-0.45268	-0.039324	0.705486	0.003196
1963	-0.469941	-0.017261	0.70716	0.001674
1964	-0.47763	-0.007689	0.799703	0.092543
1965	-0.518298	-0.040668	0.800274	0.000571
1966	-0.535036	-0.016738	0.799437	-0.000837
1967	-0.541491	-0.006455	0.797306	-0.002131
1968	-0.543251	-0.00176	0.834863	0.037557
1969	-0.5592	-0.015949	0.83121	-0.003653
1970	-0.564187	-0.004987	0.826492	-0.004718
1971	-0.564296	-0.000109	0.82086	-0.005632
1972	-0.562089	0.002207	0.832542	0.011682
1973	-0.565932	-0.003843	0.825731	-0.006811
1974	-0.564727	0.001206	0.818235	-0.007496
1975	-0.56119	0.003536	0.810167	-0.008067
1976	-0.556481	0.004709	0.809673	-0.000495
1977	-0.554365	0.002117	0.800845	-0.008828
1978	-0.549934	0.004431	0.79156	-0.009285
1979	-0.544359	0.005575	0.781895	-0.009665

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
MILPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT_ CATKSNF	IMP.MULT_ CATKSNF	CUM.MULT_ COWKSMC	IMP.MULT_ COWKSMC
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	-0.443573	-0.443573	-0.443543	-0.443543
1956	0.130709	0.574282	0.130747	0.57429
1957	0.130709	0.	0.130747	0.
1958	0.088728	-0.041981	0.130747	0.
1959	-0.143019	-0.231747	-0.055011	-0.185758
1960	0.08381	0.226829	0.209905	0.264916
1961	0.066039	-0.01777	0.220336	0.010431
1962	0.037881	-0.028159	0.230553	0.010217
1963	-0.068132	-0.106013	0.158275	-0.072278
1964	0.033391	0.101523	0.285417	0.127142
1965	0.029547	-0.003843	0.299691	0.014274
1966	0.023155	-0.006393	0.313704	0.014013
1967	-0.016496	-0.03965	0.290951	-0.022753
1968	0.036625	0.053121	0.356349	0.065397
1969	0.043665	0.00704	0.37161	0.015261
1970	0.049981	0.006317	0.386569	0.014959
1971	0.0418	-0.008181	0.385064	-0.001505
1972	0.074906	0.033105	0.422431	0.037367
1973	0.087767	0.012862	0.437449	0.015019
1974	0.100324	0.012557	0.452173	0.014724
1975	0.106451	0.006126	0.459439	0.007266
1976	0.130918	0.024468	0.483778	0.024339
1977	0.146405	0.015487	0.498074	0.014296
1978	0.161702	0.015297	0.512084	0.01401
1979	0.174107	0.012405	0.522655	0.010571

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
MILPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT_ COWSEMC	IMP.MULT_ COWSEMC	CUM.MULT_ COWSNMC	IMP.MULT_ COWSNMC
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	0.210828	0.210828	0.	0.
1956	0.210828	0.	0.654382	0.654382
1957	0.210828	0.	0.721392	0.06701
1958	0.210828	0.	0.78707	0.065678
1959	0.315064	0.104237	0.851454	0.064384
1960	0.325738	0.010674	1.2045	0.353047
1961	0.3362	0.010462	1.29624	0.091744
1962	0.346457	0.010257	1.3862	0.089955
1963	0.402694	0.056236	1.47434	0.088136
1964	0.417308	0.014614	1.68919	0.214859
1965	0.431637	0.014329	1.78725	0.098051
1966	0.445676	0.014039	1.88336	0.096115
1967	0.479901	0.034225	1.97757	0.094207
1968	0.495519	0.015618	2.12684	0.149276
1969	0.510828	0.015309	2.22336	0.096514
1970	0.525833	0.015004	2.31799	0.094633
1971	0.54961	0.023778	2.41078	0.092788
1972	0.564986	0.015375	2.52699	0.116214
1973	0.580059	0.015073	2.61889	0.091898
1974	0.594838	0.014778	2.70901	0.090115
1975	0.61335	0.018512	2.79737	0.088367
1976	0.627988	0.014638	2.89522	0.097846
1977	0.642341	0.014353	2.98141	0.086188
1978	0.656418	0.014077	3.06593	0.084521
1979	0.672003	0.015585	3.14883	0.082899

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
MILPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT_ COWYILD	IMP.MULT_ COWYILD	CUM.MULT_HAFCAV	IMP.MULT_HAFCAV
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	0.043681	0.043681	0.	0.
1956	0.04634	0.002659	-0.210847	-0.210847
1957	0.043475	-0.002866	0.048212	0.259059
1958	0.037213	-0.006262	0.504951	0.456739
1959	0.019059	-0.018153	0.899552	0.3946
1960	-0.007722	-0.026782	1.08684	0.187292
1961	-0.030848	-0.023126	1.38673	0.299889
1962	-0.051546	-0.020698	1.70508	0.318344
1963	-0.074948	-0.023402	1.94777	0.242696
1964	-0.100479	-0.025531	2.06448	0.116706
1965	-0.123248	-0.022769	2.20561	0.141135
1966	-0.144141	-0.020893	2.33473	0.129111
1967	-0.165653	-0.021511	2.41315	0.078425
1968	-0.187671	-0.022018	2.42034	0.007192
1969	-0.208119	-0.020448	2.42392	0.003577
1970	-0.227445	-0.019326	2.40839	-0.015525
1971	-0.246796	-0.019352	2.3571	-0.051294
1972	-0.266148	-0.019352	2.26128	-0.095815
1973	-0.284599	-0.018451	2.15128	-0.110009
1974	-0.302357	-0.017758	2.02045	-0.130823
1975	-0.319945	-0.017587	1.8617	-0.158753
1976	-0.337351	-0.017406	1.67136	-0.190337
1977	-0.354184	-0.016833	1.46314	-0.208221
1978	-0.370544	-0.01636	1.23433	-0.228807
1979	-0.386664	-0.01612	0.981859	-0.252476

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
MILPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT_MILAP	IMP.MULT_MILAP	CUM.MULT_MILAP2	IMP.MULT_MILAP2
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	2.81776	2.81776	1.22539	1.22539
1956	5.09225	2.27449	3.50464	2.27925
1957	5.45724	0.364996	5.04799	1.54335
1958	5.77003	0.312788	5.3666	0.31861
1959	6.87331	1.10328	5.83742	0.470819
1960	8.00658	1.13327	6.83599	0.998564
1961	8.28052	0.273937	7.68044	0.844452
1962	8.61827	0.33775	7.97215	0.291707
1963	9.43042	0.812146	8.38539	0.413246
1964	10.2899	0.859445	9.11047	0.725083
1965	10.7404	0.450499	9.78765	0.677175
1966	11.2416	0.501222	10.2004	0.412751
1967	12.0076	0.766065	10.6799	0.479533
1968	12.8201	0.812489	11.3313	0.651414
1969	13.4345	0.614389	11.9765	0.645135
1970	14.0747	0.640151	12.4923	0.515796
1971	14.8549	0.780221	13.0385	0.546238
1972	15.6495	0.794604	13.6742	0.635661
1973	16.3437	0.694261	14.3019	0.627708
1974	17.0459	0.7021	14.863	0.561078
1975	17.7993	0.75347	15.4342	0.5712
1976	18.5667	0.767397	16.0369	0.602707
1977	19.3029	0.736232	16.6398	0.602898
1978	20.0602	0.757199	17.2206	0.580789
1979	20.8638	0.803661	17.8159	0.595325

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
MILPF FROM CURRENT PERIOD BY 10% (Continued)

	CUM.MULT_SAHKS	IMP.MULT_SAHKS	CUM.MULT_SAHKSFD	IMP.MULT_SAHKSFD
1953	NA	NA	NA	NA
1954	NA	NA	NA	NA
1955	0.	0.	0.	0.
1956	0.	0.	0.	0.
1957	0.	0.	0.	0.
1958	0.147794	0.147794	0.189775	0.189775
1959	0.289653	0.141858	0.37761	0.187835
1960	0.393078	0.103426	0.519126	0.141516
1961	0.461077	0.067999	0.615322	0.096196
1962	0.569031	0.107954	0.761632	0.14631
1963	0.657731	0.088699	0.884046	0.122414
1964	0.718919	0.061188	0.970881	0.086835
1965	0.757884	0.038965	1.02796	0.057078
1966	0.810434	0.05255	1.10094	0.072984
1967	0.851758	0.041325	1.15916	0.05822
1968	0.879042	0.027283	1.19874	0.039574
1969	0.8951	0.016058	1.22301	0.024277
1970	0.916143	0.021043	1.25269	0.029681
1971	0.931363	0.015221	1.27457	0.02188
1972	0.939659	0.008295	1.28713	0.012557
1973	0.942399	0.00274	1.29204	0.004909
1974	0.946851	0.004452	1.29866	0.006621
1975	0.948297	0.001446	1.30125	0.002588
1976	0.946356	-0.001941	1.29919	-0.002055
1977	0.941676	-0.00468	1.29333	-0.00586
1978	0.937528	-0.004148	1.28789	-0.005441
1979	0.931858	-0.00567	1.2804	-0.007496

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
MILPF FROM CURRENT PERIOD BY 10% (Continued)

	IMP.MULT_VEAAT	CUM.MULT_VEAAT
1953	NA	NA
1954	NA	NA
1955	0.	0.
1956	0.	0.
1957	-22.816	-22.816
1958	-4.32576	-27.1418
1959	-3.15924	-30.301
1960	-1.15252	-31.4536
1961	-10.7423	-42.1958
1962	-2.22346	-44.4193
1963	-1.55192	-45.9712
1964	-0.561345	-46.5325
1965	-4.73673	-51.2693
1966	-0.90838	-52.1777
1967	-0.561954	-52.7396
1968	-0.080975	-52.8206
1969	-1.88921	-54.7098
1970	-0.160123	-54.8699
1971	0.024353	-54.8456
1972	0.258754	-54.5868
1973	-0.519944	-55.1068
1974	0.264843	-54.8419
1975	0.361647	-54.4803
1976	0.48037	-53.9999
1977	0.142467	-53.8574
1978	0.496808	-53.3606
1979	0.552212	-52.8084

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10%

OUTPUT

	CUM.MULT_BAGKS	IMP.MULT_BAGKS	CUM.MULT_HOGSM	IMP.MULT_HOGSM
1956	NA	NA	NA	NA
1957	NA	NA	NA	NA
1958	0.	0.	0.086377	0.086377
1959	-11.5512	-11.5512	-17.8593	-17.9456
1960	-25.0513	-13.5001	-26.3501	-8.49081
1961	-32.0361	-6.9848	-30.9816	-4.63151
1962	-36.1722	-4.13614	-33.9657	-2.98409
1963	-38.9597	-2.78749	-36.2323	-2.26664
1964	-41.0633	-2.10356	-37.8274	-1.59511
1965	-42.5712	-1.50791	-38.9483	-1.12085
1966	-43.6519	-1.08066	-39.8058	-0.8575
1967	-44.4708	-0.818944	-40.4467	-0.640877
1968	-45.0823	-0.611449	-40.9326	-0.485971
1969	-45.543	-0.460767	-41.2854	-0.352728
1970	-45.8804	-0.337333	-41.5604	-0.27507
1971	-46.1395	-0.25913	-41.7611	-0.200683
1972	-46.3297	-0.190192	-41.9055	-0.144415
1973	-46.4682	-0.138557	-42.0098	-0.104224
1974	-46.5693	-0.101091	-42.0891	-0.079292
1975	-46.6450	-0.076431	-42.1471	-0.058039
1976	-46.702	-0.056268	-42.1935	-0.046458
1977	-46.7459	-0.04387	-42.2277	-0.034196
1978	-46.7785	-0.032425	-42.2523	-0.024523
1979	-46.802	-0.023706	-42.2711	-0.018801

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT. HOGSNBR	IMP.MULT. HOGSNBR	CUM.MULT.PIGSC	IMP.MULT.PIGSC
1956	NA	NA	NA	NA
1957	NA	NA	NA	NA
1958	-1.57143	-1.57143	0.	0.
1959	-2.59291	-1.02148	-31.0742	-31.0742
1960	-3.35348	-0.760565	-36.9661	-5.89188
1961	-3.91978	-0.566302	-41.3531	-4.38696
1962	-4.34144	-0.421666	-44.6194	-3.26638
1963	-4.6554	-0.313959	-47.0516	-2.43217
1964	-4.88917	-0.233764	-48.8625	-1.81091
1965	-5.06322	-0.174048	-50.2108	-1.34824
1966	-5.19281	-0.129591	-51.2147	-1.00396
1967	-5.2893	-0.096493	-51.9622	-0.747418
1968	-5.36116	-0.071859	-52.5187	-0.556544
1969	-5.41467	-0.053509	-52.9331	-0.414445
1970	-5.45452	-0.03985	-53.2417	-0.308586
1971	-5.48419	-0.029675	-53.4716	-0.229838
1972	-5.50629	-0.022088	-53.6427	-0.171119
1973	-5.52273	-0.016451	-53.7701	-0.127385
1974	-5.53498	-0.012253	-53.8649	-0.094824
1975	-5.54411	-0.009128	-53.9356	-0.070709
1976	-5.55091	-0.006795	-53.9883	-0.052725
1977	-5.55596	-0.005058	-54.0276	-0.039237
1978	-5.55973	-0.003764	-54.0567	-0.029156
1979	-5.56253	-0.002801	-54.0784	-0.021662

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT_ PIGSEBR	IMP.MULT_ PIGSEBR	CUM.MULT_ PORAP77	IMP.MULT_ PURAP77
1956	NA	NA	NA	NA
1957	NA	NA	NA	NA
1958	-0.086411	-0.086411	317.945	317.945
1959	0.689745	0.776156	-2433.66	-2751.6
1960	0.132392	-0.557353	-4820.3	-2366.64
1961	-0.282606	-0.414998	-6194.48	-1374.18
1962	-0.591618	-0.309011	-7024.05	-829.565
1963	-0.821695	-0.230077	-7580.04	-555.985
1964	-0.993001	-0.171306	-7991.62	-411.591
1965	-1.12054	-0.127539	-8289.52	-297.89
1966	-1.2155	-0.09496	-8504.43	-214.916
1967	-1.28621	-0.070709	-8665.78	-161.344
1968	-1.33887	-0.052666	-8786.28	-120.502
1969	-1.37809	-0.039212	-8876.86	-90.5773
1970	-1.40729	-0.029207	-8943.58	-66.721
1971	-1.42904	-0.021747	-8994.29	-50.7121
1972	-1.44523	-0.016187	-9031.75	-37.4586
1973	-1.45728	-0.012057	-9059.2	-27.1487
1974	-1.46627	-0.008983	-9079.29	-20.0895
1975	-1.47296	-0.006693	-9094.39	-15.102
1976	-1.47794	-0.004981	-9105.59	-11.1957
1977	-1.48165	-0.003704	-9114.16	-8.57991
1978	-1.4844	-0.00275	-9120.55	-6.38262
1979	-1.48645	-0.002052	-9125.25	-4.70849

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT. PORAS77	IMP.MULT. PORAS77	CUM.MULT.PORHT1	IMP.MULT.PORHT1
1956	NA	NA	NA	NA
1957	NA	NA	NA	NA
1958	317.945	317.945	0.994014	0.994014
1959	-2432.65	-2750.59	-205.179	-206.173
1960	-5025.45	-2592.81	-409.346	-204.167
1961	-6603.81	-1578.35	-568.031	-158.685
1962	-7592.07	-988.259	-684.277	-116.245
1963	-8264.3	-672.232	-770.36	-86.0834
1964	-8762.	-497.704	-833.146	-62.7853
1965	-9122.68	-360.67	-878.449	-45.3038
1966	-9382.89	-260.222	-911.701	-33.2518
1967	-9577.48	-194.583	-936.24	-24.5386
1968	-9722.5	-145.021	-954.498	-18.2585
1969	-9831.32	-108.818	-967.981	-13.4832
1970	-9911.54	-80.2187	-978.104	-10.1232
1971	-9972.36	-60.8267	-985.638	-7.53385
1972	-10017.4	-44.9922	-991.189	-5.55046
1973	-10050.4	-32.9943	-995.254	-4.00543
1974	-10074.5	-24.1702	-998.262	-3.0082
1975	-10092.6	-18.1015	-1000.48	-2.22141
1976	-10106.1	-13.4279	-1002.17	-1.68244
1977	-10116.3	-10.254	-1003.43	-1.26208
1978	-10123.9	-7.63821	-1004.36	-0.932978
1979	-10129.6	-5.65018	-1005.06	-0.697554

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CORPF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT_SOWKS	IMP.MULT_SOWKS
1956	NA	NA
1957	NA	NA
1958	1.48502	1.48502
1959	1.71123	0.226211
1960	0.892957	-0.818272
1961	0.283696	-0.609261
1962	-0.169952	-0.453648
1963	-0.507736	-0.337784
1964	-0.759237	-0.251501
1965	-0.946491	-0.187255
1966	-1.08591	-0.139417
1967	-1.18972	-0.103807
1968	-1.26701	-0.0773
1969	-1.32458	-0.057562
1970	-1.36744	-0.042865
1971	-1.39936	-0.031923
1972	-1.42314	-0.023774
1973	-1.44083	-0.017694
1974	-1.45401	-0.013181
1975	-1.46383	-0.009818
1976	-1.47115	-0.007314
1977	-1.47659	-0.005441
1978	-1.48063	-0.004045
1979	-1.48365	-0.003014

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
BAGPM7C FROM CURRENT PERIOD BY 10%

OUTPUT

	CUM.MULT.BAGKS	IMP.MULT.BAGKS	CUM.MULT.HOGSM	IMP.MULT.HOGSM
1956	NA	NA	NA	NA
1957	NA	NA	NA	NA
1958	-0.609913	-0.609913	0.604654	0.604654
1959	0.470901	1.08681	1.87772	1.27306
1960	1.41238	0.935475	2.4516	0.57388
1961	1.87341	0.461031	2.75082	0.299219
1962	2.13603	0.262627	2.9378	0.186988
1963	2.30904	0.173003	3.07758	0.13978
1964	2.4382	0.129162	3.17523	0.09765
1965	2.53032	0.092126	3.24361	0.068375
1966	2.59619	0.065866	3.29583	0.05222
1967	2.64607	0.049876	3.33482	0.038995
1968	2.68327	0.037202	3.36439	0.029568
1969	2.7113	0.028031	3.38584	0.021453
1970	2.73183	0.020526	3.40257	0.016728
1971	2.74757	0.015741	3.41479	0.012222
1972	2.75915	0.011582	3.42357	0.008779
1973	2.76757	0.008417	3.42992	0.006352
1974	2.77373	0.006164	3.43476	0.004838
1975	2.77838	0.004649	3.4383	0.003534
1976	2.7818	0.003421	3.44109	0.002796
1977	2.78445	0.002652	3.44315	0.002057
1978	2.78641	0.001959	3.44463	0.001484
1979	2.78784	0.001424	3.44579	0.001153

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
BAGPM7C FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT_HOGSNBR	IMP.MULT_HOGSNBR	CUM.MULT_PIGSC	IMP.MULT_PIGSC
1956	NA	NA	NA	NA
1957	NA	NA	NA	NA
1958	0.095604	0.095604	0.	0.
1959	0.15775	0.062146	1.89054	1.89054
1960	0.204023	0.046273	2.249	0.358453
1961	0.238476	0.034453	2.51589	0.2669
1962	0.26413	0.025653	2.71462	0.198728
1963	0.283231	0.019101	2.86259	0.14797
1964	0.297453	0.014222	2.97277	0.110173
1965	0.308043	0.01059	3.0548	0.082037
1966	0.315928	0.007885	3.11588	0.061081
1967	0.321799	0.005871	3.16137	0.045483
1968	0.32617	0.004371	3.19523	0.033864
1969	0.329425	0.003255	3.22045	0.025221
1970	0.331849	0.002424	3.23923	0.018778
1971	0.333653	0.001805	3.25321	0.013978
1972	0.334997	0.001344	3.26361	0.010406
1973	0.335998	0.001001	3.27137	0.007754
1974	0.336744	0.000746	3.27715	0.00578
1975	0.337299	0.000555	3.28145	0.004303
1976	0.337712	0.000413	3.28465	0.003195
1977	0.338019	0.000308	3.28703	0.002381
1978	0.338248	0.000229	3.2888	0.001771
1979	0.338419	0.00017	3.29012	0.001319

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
BAGPM7C FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT. PIGSEBR	IMP.MULT. PIGSEBR	CUM.MULT. PORAP77	IMP.MULT. PORAP77
1956	NA	NA	NA	NA
1957	NA	NA	NA	NA
1958	0.005256	0.005256	-106.404	-106.404
1959	-0.041965	-0.047221	106.818	213.222
1960	-0.008056	0.033909	273.051	166.232
1961	0.017191	0.025247	363.979	90.9288
1962	0.03599	0.018799	416.777	52.7976
1963	0.049988	0.013997	451.33	34.5528
1964	0.06041	0.010422	476.616	25.2858
1965	0.06817	0.00776	494.82	18.2043
1966	0.073949	0.005779	507.918	13.0981
1967	0.078251	0.004302	517.745	9.82649
1968	0.081455	0.003203	525.077	7.33225
1969	0.08384	0.002385	530.584	5.50739
1970	0.085616	0.001776	534.641	4.05676
1971	0.086939	0.001323	537.724	3.08259
1972	0.087924	0.000985	540.004	2.28012
1973	0.088657	0.000733	541.67	1.66668
1974	0.089203	0.000546	542.893	1.22301
1975	0.08961	0.000406	543.81	0.916291
1976	0.089912	0.000302	544.487	0.67709
1977	0.090137	0.000226	545.004	0.516981
1978	0.090305	0.000168	545.389	0.385807
1979	0.09043	0.000125	545.671	0.281639

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
BAGPM7C FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT_PORAS77	IMP.MULT_PORAS77	CUM.MULT_PORHT1	IMP.MULT_PORHT1
1956	NA	NA	NA	NA
1957	NA	NA	NA	NA
1958	-106.404	-106.404	11.8119	11.8119
1959	118.632	225.035	37.4168	25.6049
1960	310.47	191.838	57.2374	19.8205
1961	421.219	110.75	70.91	13.6726
1962	487.69	66.4706	80.118	9.20806
1963	531.45	43.7601	86.4789	6.36086
1964	563.096	31.6458	90.8856	4.40669
1965	585.706	22.6102	93.9468	3.06121
1966	601.864	16.1576	96.1277	2.18084
1967	613.872	12.0082	97.702	1.57433
1968	622.78	8.90827	98.8547	1.15272
1969	629.441	6.66095	99.6965	0.841782
1970	634.339	4.89781	100.324	0.627056
1971	638.049	3.70953	100.788	0.464362
1972	640.792	2.74308	101.129	0.340746
1973	642.798	2.00619	101.378	0.248845
1974	644.27	1.47185	101.562	0.184223
1975	645.369	1.09955	101.697	0.13568
1976	646.181	0.812123	101.8	0.102193
1977	646.801	0.619219	101.876	0.076355
1978	647.264	0.462968	101.932	0.056545
1979	647.601	0.337581	101.975	0.042439

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
BAGPM7C FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT_SOWKS	IMP.MULT_SOWKS
1956	NA	NA
1957	NA	NA
1958	-0.090348	-0.090348
1959	-0.104112	-0.013764
1960	-0.054329	0.049783
1961	-0.017262	0.037067
1962	0.010337	0.027599
1963	0.030887	0.02055
1964	0.046188	0.015301
1965	0.05758	0.011393
1966	0.066064	0.008483
1967	0.07238	0.006316
1968	0.077083	0.004703
1969	0.080585	0.003502
1970	0.083192	0.002607
1971	0.085134	0.001942
1972	0.086579	0.001445
1973	0.087656	0.001077
1974	0.088458	0.000802
1975	0.089055	0.000597
1976	0.089499	0.000444
1977	0.08983	0.000331
1978	0.090076	0.000246
1979	0.090259	0.000183

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
LAMPRIF FROM CURRENT PERIOD BY 10%

OUTPUT

	CUM.MULT. LAMCROP	IMP.MULT. LAMCROP	CUM.MULT. LAMPROD	IMP.MULT. LAMPROD
1957	NA	NA	NA	NA
1958	NA	NA	NA	NA
1959	27.1892	27.1892	NA	NA
1960	107.097	79.9081	-2.05803	-2.05803
1961	212.919	105.821	-2.16133	-0.103299
1962	354.554	141.635	-0.242072	1.91926
1963	525.367	170.813	3.6972	3.93927
1964	719.066	193.698	9.36658	5.66939
1965	929.769	210.703	16.4654	7.09883
1966	1152.04	222.27	24.7058	8.24037
1967	1380.92	228.883	33.8167	9.11089
1968	1611.96	231.042	43.5468	9.73012
1969	1841.22	229.258	53.6651	10.1183
1970	2065.27	224.043	63.9634	10.2983
1971	2281.17	215.9	74.2554	10.292
1972	2486.48	205.313	84.3781	10.1227
1973	2679.23	192.754	94.191	9.81284
1974	2857.9	178.664	103.576	9.3846
1975	3021.35	163.453	112.435	8.8596
1976	3168.85	147.5	120.693	8.25768
1977	3300.	131.149	128.291	7.59787
1978	3414.71	114.712	135.189	6.89819
1979	3513.17	98.4587	141.363	6.17396
			146.803	5.4398

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
LAMPRIF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT. LAMSHISL	IMP.MULT. LAMSHISL	CUM.MULT. LAMSHIST	IMP.MULT. LAMSHIST
1957	NA	NA	NA	NA
1958	NA	NA	NA	NA
1959	-58.2357	-58.2357	0.	0.
1960	-64.3701	-6.13437	85.4249	85.4249
1961	-16.5755	47.7945	256.892	171.467
1962	77.783	94.3586	486.386	229.494
1963	211.511	133.728	763.157	276.771
1964	377.661	166.15	1077.01	313.856
1965	569.62	191.959	1418.42	341.404
1966	781.172	211.552	1778.57	360.148
1967	1006.56	225.385	2149.43	370.866
1968	1240.49	233.933	2523.8	374.365
1969	1478.2	237.71	2895.27	371.475
1970	1715.44	237.24	3258.29	363.022
1971	1948.49	233.052	3608.12	349.825
1972	2174.15	225.662	3940.79	332.673
1973	2389.74	215.584	4253.11	312.324
1974	2593.05	203.311	4542.61	289.494
1975	2782.35	189.303	4807.46	264.847
1976	2956.34	173.992	5046.45	238.998
1977	3114.13	157.784	5258.96	212.505
1978	3255.18	141.047	5444.83	185.87
1979	3379.29	124.111	5604.36	159.535

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
LAMPRIF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT. WOOLPROD	IMP.MULT. WOOLPROD
1957	NA	NA
1958	NA	NA
1959	0.	0.
1960	792.174	792.174
1961	2382.23	1590.05
1962	4510.39	2128.17
1963	7076.97	2566.57
1964	9987.47	2910.5
1965	13153.4	3165.94
1966	16493.2	3339.75
1967	19932.3	3439.14
1968	23403.9	3471.61
1969	26848.7	3444.8
1970	30215.1	3366.41
1971	33459.2	3244.07
1972	36544.2	3085.
1973	39440.5	2896.26
1974	42125.	2684.56
1975	44581.1	2456.04
1976	46797.3	2216.29
1977	48768.	1970.63
1978	50491.6	1723.62
1979	51971.	1479.44

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
WOOLPRIF FROM CURRENT PERIOD BY 10%

OUTPUT

	CUM.MULT. LAMCROP	IMP.MULT. LAMCROP	CUM.MULT. LAMPROD	IMP.MULT. LAMPROD
1957	NA	NA	NA	NA
1958	NA	NA	NA	NA
1959	0.	0.	-0.812566	-0.812566
1960	12.4404	12.4404	-2.1133	-1.30074
1961	51.5937	39.1533	-2.1176	-0.004295
1962	113.567	61.9734	-0.863486	1.25411
1963	194.582	81.0147	1.48373	2.34722
1964	291.017	96.4355	4.75349	3.26976
1965	399.451	108.434	8.78089	4.0274
1966	516.687	117.236	13.409	4.62809
1967	639.783	123.096	18.4906	5.08162
1968	766.062	126.279	23.8894	5.39878
1969	893.124	127.062	29.4806	5.59121
1970	1018.85	125.726	35.1516	5.67106
1971	1141.4	122.552	40.8025	5.65083
1972	1259.22	117.814	46.3455	5.54306
1973	1371.	111.781	51.7058	5.36023
1974	1475.7	104.707	56.8202	5.11445
1975	1572.54	96.8325	61.6376	4.81736
1976	1660.92	88.3788	66.1175	4.47991
1977	1740.47	79.5526	70.23	4.11256
1978	1811.01	70.5392	73.9546	3.72453
1979	1872.51	61.5059	77.2793	3.32469

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
WOOLPRIF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT. LAMSHISL	IMP.MULT. LAMSHISL	CUM.MULT. LAMSHIST	IMP.MULT. LAMSHIST
1957	NA	NA	NA	NA
1958	NA	NA	NA	NA
1959	-20.1581	-20.1581	0.	0.
1960	-51.0005	-30.8425	20.1581	20.1581
1961	-48.8231	2.17739	83.599	63.4409
1962	-17.7031	31.1201	184.016	100.417
1963	38.325	56.028	315.286	131.27
1964	115.32	76.9954	471.543	156.257
1965	209.49	94.1695	647.24	175.697
1966	317.232	107.742	837.201	189.961
1967	435.171	117.939	1036.66	199.456
1968	560.181	125.01	1241.27	204.612
1969	689.408	129.227	1447.15	205.881
1970	820.277	130.87	1650.87	203.716
1971	950.505	130.228	1849.44	198.573
1972	1078.09	127.589	2040.34	190.897
1973	1201.34	123.244	2221.46	181.122
1974	1318.81	117.468	2391.12	169.659
1975	1429.33	110.529	2548.02	156.899
1976	1532.01	102.68	2691.22	143.202
1977	1626.17	94.1568	2820.12	128.901
1978	1711.35	85.1769	2934.42	114.297
1979	1787.29	75.9384	3034.08	99.6591

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
WOOLPRIF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT. WOOLPROD	IMP.MULT. WOOLPROD
1957	NA	NA
1958	NA	NA
1959	0.	0.
1960	186.923	186.923
1961	775.224	588.301
1962	1706.42	931.2
1963	2923.72	1217.3
1964	4372.75	1449.03
1965	6002.05	1629.3
1966	7763.61	1761.56
1967	9613.22	1849.61
1968	11510.7	1897.44
1969	13419.9	1909.2
1970	15309.	1889.12
1971	17150.4	1841.44
1972	18920.7	1770.26
1973	20600.3	1679.6
1974	22173.6	1573.31
1975	23628.6	1454.98
1976	24956.5	1327.96
1977	26151.9	1195.34
1978	27211.8	1059.91
1979	28136.	924.183

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
FDE FROM CURRENT PERIOD BY 10%
FDC FROM CURRENT PERIOD BY 10%

OUTPUT

	DELTA_CHIAPOT	CUM_DELTA_CHIAPOT	DELTA_CHIASOT	CUM_DELTA_CHIASOT
1961	0.	0.	0.	0.
1962	0.	0.	0.	0.
1963	-3.51343	-3.51343	-3.51343	-3.51343
1964	-5.2937	-8.80713	-6.69116	-10.2046
1965	-3.09131	-11.8984	-4.82104	-15.0256
1966	-2.27661	-14.175	-3.12964	-18.1553
1967	-1.67651	-15.8516	-2.45972	-20.615
1968	-1.23437	-17.0859	-1.72095	-22.3359
1969	-0.908936	-17.9949	-1.28125	-23.6172
1970	-0.669434	-18.6643	-0.930176	-24.5474
1971	-0.492676	-19.157	-0.685059	-25.2324
1972	-0.363037	-19.52	-0.502686	-25.7351
1973	-0.267334	-19.7874	-0.369873	-26.105
1974	-0.196777	-19.9841	-0.271729	-26.3767
1975	-0.145264	-20.1294	-0.200439	-26.5771
1976	-0.107178	-20.2366	-0.147949	-26.7251
1977	-0.078857	-20.3154	-0.108643	-26.8337
1978	-0.058105	-20.3735	-0.080322	-26.9141
1979	-0.042969	-20.4165	-0.059326	-26.9734

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
FDE FROM CURRENT PERIOD BY 10%
FDC FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	DELTA_CHIASYO	CUM_DELTA_CHIASYO	DELTA_CHIHTOT1	CUM_DELTA_CHIHTOT1
1961	0.	0.	0.	0.
1962	0.	0.	0.	0.
1963	-45.8672	-45.8672	-1.39746	-1.39746
1964	-84.7148	-130.582	-1.72992	-3.12738
1965	-61.7148	-192.297	-0.853043	-3.98042
1966	-35.25	-227.547	-0.783249	-4.76367
1967	-19.8906	-247.437	-0.486481	-5.25015
1968	-12.0547	-259.492	-0.372345	-5.6225
1969	-7.47256	-266.965	-0.260681	-5.88318
1970	-4.85937	-271.824	-0.192337	-6.07552
1971	-3.24609	-275.07	-0.139511	-6.21503
1972	-2.23828	-277.309	-0.102631	-6.31766
1973	-1.5625	-278.871	-0.075134	-6.39279
1974	-1.11719	-279.988	-0.055206	-6.448
1975	-0.804688	-280.793	-0.040726	-6.48872
1976	-0.589844	-281.383	-0.029785	-6.51851
1977	-0.4375	-281.82	-0.022232	-6.54074
1978	-0.320313	-282.141	-0.016251	-6.55699
1979	-0.234375	-282.375	-0.012009	-6.569

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
FDE FROM CURRENT PERIOD BY 10%
FDC FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	DELTA_CHIHTY01	CUM_DELTA_CHIHTY01	DELTA_CHISPYO	CUM_DELTA_CHISPYO
1961	0.	0.	0.	0.
1962	0.	0.	0.	0.
1963	-0.297958	-0.297958	-45.8672	-45.8672
1964	-0.29866	-0.596619	-84.4141	-130.281
1965	-0.097015	-0.693634	-61.4141	-191.695
1966	-0.143021	-0.836655	-35.1523	-226.848
1967	-0.094116	-0.930771	-19.7461	-246.594
1968	-0.080048	-1.01082	-11.9609	-258.555
1969	-0.058533	-1.06935	-7.39453	-265.949
1970	-0.044846	-1.1142	-4.80078	-270.75
1971	-0.033234	-1.14743	-3.20313	-273.953
1972	-0.024841	-1.17227	-2.20312	-276.156
1973	-0.018387	-1.19066	-1.53906	-277.695
1974	-0.013596	-1.20425	-1.09766	-278.793
1975	-0.010071	-1.21432	-0.792969	-279.586
1976	-0.007355	-1.22168	-0.582031	-280.168
1977	-0.005508	-1.22719	-0.429688	-280.598
1978	-0.004028	-1.23122	-0.3125	-280.91
1979	-0.002975	-1.23419	-0.230469	-281.141

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
FDE FROM CURRENT PERIOD BY 10%
FDC FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	DELTA_CHISVLA	CUM_DELTA_ CHISVLA	DELTA_EGGAAD	CUM_DELTA_ EGGAAD
1961	0.	0.	0.	0.
1962	0.	0.	0.	0.
1963	-1.06299	-1.06299	0.006592	0.006592
1964	-1.84595	-2.90894	0.014099	0.020691
1965	-1.35937	-4.26831	0.014114	0.034805
1966	-1.00098	-5.26929	0.011887	0.046692
1967	-0.737061	-6.00635	0.009369	0.056061
1968	-0.542725	-6.54907	0.007141	0.063202
1969	-0.399658	-6.94873	0.005356	0.068558
1970	-0.294189	-7.24292	0.003983	0.07254
1971	-0.216797	-7.45972	0.002945	0.075485
1972	-0.159668	-7.61938	0.002182	0.077667
1973	-0.117432	-7.73682	0.001602	0.079269
1974	-0.08667	-7.82349	0.001175	0.080444
1975	-0.063965	-7.88745	0.00087	0.081314
1976	-0.047119	-7.93457	0.000641	0.081955
1977	-0.034668	-7.96924	0.000473	0.082428
1978	-0.025635	-7.99487	0.000351	0.082779
1979	-0.019043	-8.01392	0.000244	0.083023

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
FDE FROM CURRENT PERIOD BY 10%
FDC FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	DELTA_EGGAP	CUM_DELTA_EGGAP	DELTA_EGGAS	CUM_DELTA_EGGAS
1961	0.	0.	0.	0.
1962	0.	0.	0.	0.
1963	-16.8125	-16.8125	-16.8125	-16.8125
1964	-28.6289	-45.4414	-28.9492	-45.7617
1965	-20.1367	-65.5781	-20.8828	-66.6445
1966	-14.5039	-80.082	-15.3516	-81.9961
1967	-10.5859	-90.668	-11.3906	-93.3867
1968	-7.79687	-98.4648	-8.49609	-101.883
1969	-5.74609	-104.211	-6.32422	-108.207
1970	-4.24219	-108.453	-4.70312	-112.91
1971	-3.15625	-111.609	-3.51953	-116.43
1972	-2.36719	-113.977	-2.64844	-119.078
1973	-1.77734	-115.754	-1.99219	-121.07
1974	-1.32813	-117.082	-1.48828	-122.559
1975	-0.988281	-118.07	-1.10937	-123.668
1976	-0.734375	-118.805	-0.824219	-124.492
1977	-0.546875	-119.352	-0.613281	-125.105
1978	-0.40625	-119.758	-0.457031	-125.562
1979	-0.308594	-120.066	-0.34375	-125.906

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
FDE FROM CURRENT PERIOD BY 10%
FDC FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	DELTA_EGGBB	CUM_DELTA_EGGBB	CUM_DELTA_EGGHT	DELTA_EGGHT
1961	0.	0.	0.	0.
1962	0.	0.	0.	0.
1963	-3.0603	-3.0603	-0.319168	-0.319168
1964	-4.6228	-7.68311	-1.0625	-0.743332
1965	-2.53979	-10.2229	-1.91104	-0.848541
1966	-1.55396	-11.7769	-2.71428	-0.803238
1967	-0.951904	-12.7288	-3.41144	-0.697159
1968	-0.620117	-13.3489	-3.98741	-0.575974
1969	-0.412109	-13.761	-4.44864	-0.461227
1970	-0.282959	-14.0439	-4.81021	-0.361572
1971	-0.198242	-14.2422	-5.08951	-0.279297
1972	-0.140869	-14.3831	-5.30292	-0.213409
1973	-0.101318	-14.4844	-5.4646	-0.161682
1974	-0.07373	-14.5581	-5.58641	-0.121811
1975	-0.053955	-14.6121	-5.67776	-0.091354
1976	-0.039551	-14.6516	-5.74603	-0.068268
1977	-0.029297	-14.6809	-5.79689	-0.050858
1978	-0.021484	-14.7024	-5.83472	-0.037827
1979	-0.016113	-14.7185	-5.86285	-0.028137

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
FDE FROM CURRENT PERIOD BY 10%
FDC FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	DELTA_TURAP	CUM_DELTA_TURAP	DELTA_TURAS	CUM_DELTA_TURAS
1961	0.	0.	0.	0.
1962	0.	0.	0.	0.
1963	0.	0.	0.	0.
1964	0.459229	0.459229	-0.345215	-0.345215
1965	0.780762	1.23999	-0.58667	-0.931885
1966	0.694336	1.93433	-0.521729	-1.45361
1967	0.704834	2.63916	-0.529541	-1.98315
1968	0.636963	3.27612	-0.478516	-2.46167
1969	0.567871	3.84399	-0.426514	-2.88818
1970	0.486572	4.33057	-0.365234	-3.25342
1971	0.408447	4.73901	-0.307129	-3.56055
1972	0.336426	5.07544	-0.252686	-3.81323
1973	0.273193	5.34863	-0.205078	-4.01831
1974	0.219238	5.56787	-0.164551	-4.18286
1975	0.173828	5.7417	-0.130859	-4.31372
1976	0.137207	5.87891	-0.102783	-4.4165
1977	0.106689	5.9856	-0.080322	-4.49683
1978	0.083252	6.06885	-0.0625	-4.55933
1979	0.064209	6.13306	-0.04834	-4.60767

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
FDE FROM CURRENT PERIOD BY 10%
FDC FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	DELTA_TURHT1	CUM_DELTA_TURHT1
1961	0.	0.
1962	0.	0.
1963	-0.80423	-0.80423
1964	-1.36743	-2.17166
1965	-1.21606	-3.38773
1966	-1.23437	-4.6221
1967	-1.11548	-5.73758
1968	-0.994385	-6.73196
1969	-0.851837	-7.5838
1970	-0.71553	-8.29933
1971	-0.589218	-8.88855
1972	-0.478424	-9.30697
1973	-0.383865	-9.75084
1974	-0.304764	-10.0556
1975	-0.240067	-10.2957
1976	-0.187088	-10.4828
1977	-0.145737	-10.6285
1978	-0.112427	-10.7409
1979	-0.08667	-10.8276

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CHIPWBR9 FROM CURRENT PERIOD BY 10%
CHIPWXB FROM CURRENT PERIOD BY 10%

OUTPUT

	DELTA_CHIAPUT	CUM_DELTA_CHIAPUT	DELTA_CHIASOT	CUM_DELTA_CHIASOT
1961	0.	0.	0.	0.
1962	0.	0.	0.	0.
1963	3.86499	3.86499	3.86499	3.86499
1964	3.86499	7.72998	5.40234	9.26733
1965	0.	7.72998	1.12427	10.3916
1966	0.	7.72998	-0.206543	10.1851
1967	0.	7.72998	0.164307	10.3494
1968	0.	7.72998	-0.012695	10.3367
1969	0.	7.72998	0.026367	10.363
1970	0.	7.72998	0.001465	10.3645
1971	0.	7.72998	0.004883	10.3694
1972	0.	7.72998	0.000732	10.3701
1973	0.	7.72998	0.000977	10.3711
1974	0.	7.72998	0.000244	10.3713
1975	0.	7.72998	0.000244	10.3716
1976	0.	7.72998	0.	10.3716
1977	0.	7.72998	0.	10.3716
1978	0.	7.72998	0.	10.3716
1979	0.	7.72998	0.	10.3716

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CHIPWBR9 FROM CURRENT PERIOD BY 10%
CHIPWXB FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	DELTA_CHIASYO	CUM_DELTA_CHIASYO	DELTA_CHIHTOT1	CUM_DELTA_CHIHTOT1
1961	0.	0.	0.	0.
1962	0.	0.	0.	0.
1963	50.457	50.457	1.53734	1.53734
1964	67.0586	117.516	1.12416	2.6615
1965	27.3789	144.895	-0.206589	2.45491
1966	15.125	160.02	0.164352	2.61926
1967	6.8125	166.832	-0.012573	2.60669
1968	3.55078	170.383	0.026459	2.63315
1969	1.66797	172.051	0.001526	2.63467
1970	0.839844	172.891	0.004776	2.63945
1971	0.398438	173.289	0.000931	2.64038
1972	0.199219	173.488	0.000931	2.64131
1973	0.101563	173.59	0.00029	2.6416
1974	0.050781	173.641	0.000229	2.64183
1975	0.023438	173.664	9.155273E-05	2.64192
1976	0.007813	173.672	6.103516E-05	2.64198
1977	0.003906	173.676	0.	2.64198
1978	0.	173.676	1.525879E-05	2.642
1979	0.	173.676	0.	2.642

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CHIPWBR9 FROM CURRENT PERIOD BY 10%
CHIPWXB FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	DELTA_CHIHTY01	CUM_DELTA_CHIHTY01	DELTA_CHISPYO	CUM_DELTA_CHISPYO
1961	0.	0.	0.	0.
1962	0.	0.	0.	0.
1963	0.32782	0.32782	50.457	0.
1964	0.16391	0.49173	66.7344	50.457
1965	-0.130402	0.361328	27.2148	117.191
1966	0.009979	0.371307	15.2578	144.406
1967	-0.020996	0.350311	6.80078	159.664
1968	-0.001221	0.349091	3.57031	166.465
1969	-0.003784	0.345306	1.66797	170.035
1970	-0.000732	0.344574	0.84375	171.703
1971	-0.000732	0.343842	0.398438	172.547
1972	-0.000229	0.343613	0.203125	172.945
1973	-0.000183	0.34343	0.101563	173.148
1974	-7.629395E-05	0.343353	0.050781	173.25
1975	-4.577637E-05	0.343307	0.023438	173.301
1976	0.	0.343307	0.007813	173.324
1977	-1.525879E-05	0.343292	0.003906	173.332
1978	0.	0.343292	0.	173.336
1979	0.	0.343292	0.	173.336
				173.336

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CHIPWBR9 FROM CURRENT PERIOD BY 10%
CHIPWXB FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	DELTA_EGGBB	CUM_DELTA_EGGBB	DELTA_TURAP	CUM_DELTA_TURAP
1961	0.	0.	0.	0.
1962	0.	0.	0.	0.
1963	1.58325	1.58325	0.	0.
1964	2.09399	3.67725	-0.505127	-0.505127
1965	0.854004	4.53125	-0.605225	-1.11035
1966	0.47876	5.01001	-0.221436	-1.33179
1967	0.213379	5.22339	-0.169922	-1.50171
1968	0.112061	5.33545	-0.086182	-1.58789
1969	0.052246	5.3877	-0.058105	-1.646
1970	0.026367	5.41406	-0.034668	-1.68066
1971	0.012695	5.42676	-0.023438	-1.7041
1972	0.006348	5.43311	-0.014893	-1.71899
1973	0.003174	5.43628	-0.01001	-1.729
1974	0.001465	5.43774	-0.006836	-1,73584
1975	0.000732	5.43848	-0.004639	-1.74048
1976	0.000244	5.43872	-0.00293	-1.74341
1977	0.	5.43872	-0.002197	-1.74561
1978	0.	5.43872	-0.001221	-1.74683
1979	0.	5.43872	-0.000977	-1.7478

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
CHIPWBR9 FROM CURRENT PERIOD BY 10%
CHIPWXB FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	DELTA_TURAS	CUM_DELTA_TURAS	DELTA_TURHT1	CUM_DELTA_TURHT1
1961	0.	0.	0.	0.
1962	0.	0.	0.	0.
1963	0.	0.	0.884766	0.884766
1964	0.379639	0.379639	1.06006	1.94482
1965	0.454834	0.834473	0.387695	2.33252
1966	0.16626	1.00073	0.297363	2.62988
1967	0.127441	1.12817	0.150879	2.78076
1968	0.064697	1.19287	0.101929	2.88269
1969	0.043945	1.23682	0.061081	2.94377
1970	0.026367	1.26318	0.040756	2.98453
1971	0.017334	1.28052	0.026337	3.01086
1972	0.011475	1.29199	0.017685	3.02855
1973	0.007813	1.2998	0.011703	3.04025
1974	0.004883	1.30469	0.007843	3.0481
1975	0.003174	1.30786	0.005005	3.0531
1976	0.002197	1.31006	0.003662	3.05676
1977	0.001465	1.31152	0.002396	3.05916
1978	0.000977	1.3125	/0.001709	3.06087
1979	0.000732	1.31323	0.000977	3.06184

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
EGGPF FROM CURRENT PERIOD BY 10%

OUTPUT

	CUM.MULT. CHIAPOT	IMP.MULT. CHIAPOT	CUM.MULT. CHIASOT	IMP.MULT. CHIASOT
1961	NA	NA	NA	NA
1962	NA	NA	NA	NA
1963	0.	0.	0.	0.
1964	0.567544	0.567544	0.567544	0.567544
1965	1.55296	0.985418	1.77871	1.21116
1966	2.2786	0.725635	2.83609	1.05739
1967	2.81295	0.534355	3.57241	0.736321
1968	3.20655	0.393601	4.12481	0.5524
1969	3.49641	0.289858	4.5257	0.40089
1970	3.70998	0.213572	4.82193	0.296227
1971	3.86722	0.157242	5.03925	0.217323
1972	3.98307	0.115844	5.19925	0.160002
1973	4.06841	0.085344	5.31708	0.117826
1974	4.13125	0.06284	5.40384	0.086759
1975	4.17746	0.04621	5.4676	0.06376
1976	4.21143	0.033968	5.51452	0.046918
1977	4.23641	0.02498	5.54898	0.034463
1978	4.25481	0.018399	5.57432	0.025334
1979	4.26833	0.013516	5.59293	0.018611

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
EGGPF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT. CHIASYO	IMP.MULT. CHIASYO	CUM.MULT. CHIHTOT1	IMP.MULT. CHIHTOT1
1961	NA	NA	NA	NA
1962	NA	NA	NA	NA
1963	0.	0.	0.	0.
1964	7.56914	7.56914	0.225744	0.225744
1965	19.305	11.7358	0.557491	0.331747
1966	26.1574	6.85242	0.759475	0.201984
1967	30.5279	4.37051	0.918274	0.158799
1968	33.3438	2.81592	1.0293	0.111023
1969	35.2449	1.90106	1.11197	0.082668
1970	36.5538	1.30889	1.17205	0.060089
1971	37.4743	0.920525	1.21627	0.044216
1972	38.1299	0.655577	1.24871	0.032442
1973	38.6043	0.474416	1.27262	0.023906
1974	38.9462	0.341942	1.29015	0.017537
1975	39.1953	0.249097	1.30307	0.012919
1976	39.3754	0.180029	1.31255	0.009478
1977	39.5078	0.132474	1.31947	0.006922
1978	39.6041	0.096242	1.32459	0.005122
1979	39.6743	0.0702	1.32836	0.003768

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
EGGPF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT. CHIHTY01	IMP.MULT. CHIHTY01	CUM.MULT. CHISPYO	IMP.MULT. CHISPYO
1961	NA	NA	NA	NA
1962	NA	NA	NA	NA
1963	0.	0.	0.	0.
1964	0.047727	0.047727	7.56914	7.56914
1965	0.116432	0.068705	19.2574	11.6883
1966	0.159104	0.042672	26.0419	6.78449
1967	0.195213	0.036108	30.3694	4.32749
1968	0.221082	0.025869	33.1491	2.77969
1969	0.240839	0.019757	35.0241	1.87502
1970	0.25539	0.014551	36.3126	1.28851
1971	0.266204	0.010814	37.2184	0.905806
1972	0.274188	0.007983	37.8638	0.645387
1973	0.280092	0.005905	38.3303	0.46649
1974	0.28444	0.004348	38.6666	0.33628
1975	0.287646	0.003207	38.9111	0.244568
1976	0.290013	0.002366	39.0878	0.176632
1977	0.291733	0.001721	39.218	0.13021
1978	0.293011	0.001278	39.3131	0.09511
1979	0.293953	0.000942	39.3822	0.069068

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
EGGPF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT. CHISVLA	IMP.MULT. CHISVLA	CUM.MULT.EGGAAD	IMP.MULT.EGGAAD
1961	NA	NA	NA	NA
1962	NA	NA	NA	NA
1963	0.338899	0.338899	-0.002101	-0.002101
1964	0.927319	0.58842	-0.006595	-0.004494
1965	1.36062	0.433301	-0.011093	-0.004498
1966	1.6797	0.319084	-0.014883	-0.00379
1967	1.91472	0.235014	-0.017868	-0.002985
1968	2.08781	0.173094	-0.020146	-0.002278
1969	2.21533	0.12752	-0.021853	-0.001707
1970	2.30924	0.093967	-0.023127	-0.001274
1971	2.37838	0.069138	-0.024069	-0.000942
1972	2.42933	0.050952	-0.024764	-0.000694
1973	2.46684	0.037506	-0.025277	-0.000513
1974	2.49443	0.027599	-0.025657	-0.00038
1975	2.51474	0.02031	-0.025936	-0.000279
1976	2.52967	0.014932	-0.026139	-0.000203
1977	2.54064	0.010969	-0.026294	-0.000155
1978	2.54871	0.008067	-0.026405	-0.000111
1979	2.55466	0.005944	-0.026489	-8.403472E-05

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
EGGPF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT.EGGAS	IMP.MULT.EGGAS	CUM.MULT.EGGAP	IMP.MULT.EGGAP
1961	NA	NA	NA	NA
1962	NA	NA	NA	NA
1963	5.35558	5.35558	5.35558	5.35558
1964	12.8738	7.51819	14.4635	9.10788
1965	20.2063	7.3325	20.8698	6.40631
1966	25.4996	5.2933	25.4848	4.61508
1967	29.3696	3.87006	28.8567	3.37186
1968	32.2172	2.84763	31.3398	2.48304
1969	34.3187	2.10147	33.1729	1.83312
1970	35.8688	1.55006	34.5259	1.35305
1971	37.0191	1.15037	35.5314	1.00544
1972	37.8819	0.[illegible]6278	36.2877	0.756348
1973	38.5273	0.645387	36.855	0.567261
1974	39.0074	0.480077	37.2773	0.422332
1975	39.3652	0.357793	37.5921	0.314768
1976	39.6301	0.264948	37.8253	0.233245
1977	39.8249	0.194748	37.9974	0.172103
1978	39.9698	0.144929	38.1254	0.127945
1979	40.0774	0.107564	38.2205	0.09511

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
EGGPF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT_EGGBB	IMP.MULT_EGGBB	CUM.MULT_EGGHT	IMP.MULT_EGGHT
1961	NA	NA	NA	NA
1962	NA	NA	NA	NA
1963	0.516805	0.516805	-1.58946	-1.58946
1964	1.38348	0.866672	-0.663215	0.926244
1965	1.9455	0.562024	0.015617	0.678833
1966	2.3023	0.356803	0.51358	0.497963
1967	2.54411	0.241808	0.879154	0.365573
1968	2.70935	0.165239	1.1477	0.268548
1969	2.82576	0.11641	1.34509	0.197384
1970	2.90856	0.082796	1.49022	0.145132
1971	2.96814	0.059585	1.59696	0.106742
1972	3.01145	0.043309	1.67549	0.078533
1973	3.04294	0.031491	1.73328	0.057789
1974	3.06594	0.022999	1.7758	0.042522
1975	3.08271	0.016772	1.8071	0.031292
1976	3.09503	0.012313	1.83011	0.023017
1977	3.10401	0.008987	1.84704	0.016926
1978	3.11059	0.006581	1.85949	0.01245
1979	3.11548	0.004883	1.86864	0.009155

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
EGGPF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT.TURAP	IMP.MULT.TURAP	CUM.MULT.TURAS	IMP.MULT.TURAS
1961	NA	NA	NA	NA
1962	NA	NA	NA	NA
1963	0.	0.	0.	0.
1964	0.	0.	0.	0.
1965	-0.073597	-0.073597	0.055268	0.055268
1966	-0.230839	-0.157242	0.173377	0.118109
1967	-0.406339	-0.1755	0.305214	0.131837
1968	-0.584386	-0.178047	0.439033	0.133819
1969	-0.748564	-0.164177	0.562378	0.123345
1970	-0.893563	-0.145	0.671358	0.10898
1971	-1.01719	-0.123628	0.764203	0.092845
1972	-1.12008	-0.102894	0.84148	0.077277
1973	-1.20415	-0.08407	0.904744	0.063265
1974	-1.27195	-0.067794	0.955625	0.050881
1975	-1.32594	-0.053995	0.996174	0.040549
1976	-1.36847	-0.04253	1.02816	0.031986
1977	-1.40188	-0.033402	1.05328	0.025122
1978	-1.42778	-0.0259	1.07274	0.019461
1979	-1.44787	-0.020098	1.08789	0.015144

EXOGENOUS PERTURBATIONS: 1 PERIOD, STARTING AFTER 2 PERIODS
EGGPF FROM CURRENT PERIOD BY 10% (Continued)

OUTPUT

	CUM.MULT_TURHT1	IMP.MULT_TURHT1
1961	NA	NA
1962	NA	NA
1963	0.	0.
1964	0.128865	0.128865
1965	0.404216	0.275351
1966	0.711553	0.307337
1967	1.02342	0.311866
1968	1.31092	0.287505
1969	1.56487	0.253949
1970	1.78135	0.216478
1971	1.96156	0.180206
1972	2.10886	0.1473
1973	2.22754	0.118688
1974	2.32207	0.09453
1975	2.39661	0.074539
1976	2.45508	0.05847
1977	2.50049	0.045405
1978	2.53571	0.035224
1979	2.56282	0.027103